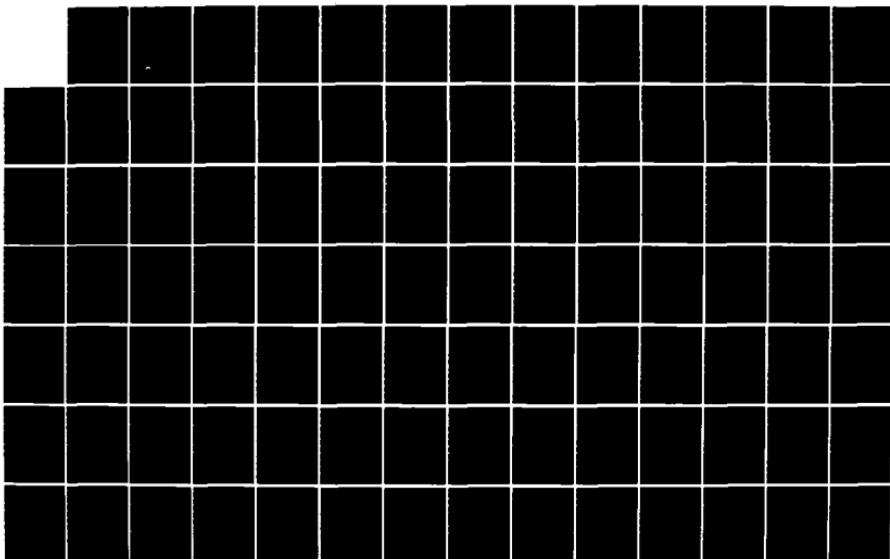


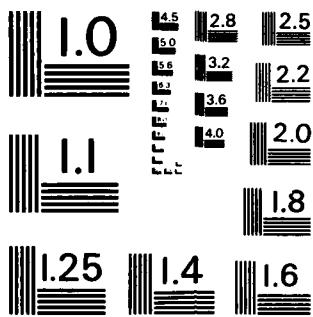
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# Defense Information Systems Program Automated CORDIVEM Design Requirements

C. Todd  
M. Aston

Contract NAS7-918

February 28, 1984

Prepared for

The U.S. Army Model Improvement  
Program Management Office (AMMO)  
Headquarters CAC and Ft. LVN  
Fort Leavenworth, Kansas

Through an agreement with

National Aeronautics and Space Administration

Prepared by

**JPL**

Jet Propulsion Laboratory  
California Institute of Technology  
Pasadena, California

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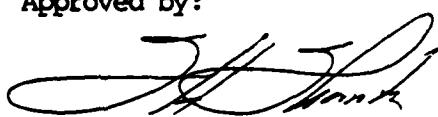
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CHANGE LOG

Document Number	Revision Date	Affected Pages	Replacement Pages	Author Approvals

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## AUTOMATED CORDIVEM DESIGN REQUIREMENTS

### SECTION 1 INTRODUCTION

1.1

#### DOCUMENT PURPOSE

This document specifies the structure and content of the Automated CORDIVEM Design Requirements. It provides the CORDIVEM functional descriptions which will be used to develop the model System Design. It is a dynamic document which will accommodate the iterations necessary to achieve a balance among the combat items to be simulated, the user requirements, and the resource constraints. This initial issue of the document provides the basic structure, organization, and description of content for all future iterations. In particular, it provides an explicit framework and a procedure for deriving and describing the model functional requirements for specific model versions. In this sense, it provides information for decisions concerning subsequent development of Automated CORDIVEM with respect to scope, manpower, and timeframe.

1.2

#### MODEL DEVELOPMENT BACKGROUND

Significant advances in lethal and non-lethal weapons system's technology in both the U.S. and aggressor nations have resulted in a highly dynamic situation in which force structures are changing to meet reactive threats. With the advent of a complex and ever growing collection of new direct and indirect fire weapons, sensor systems, communications devices, and computer systems at the disposal or potential disposal of Army commanders in the field, the scope and complexity of decision-making have increased tremendously. This new collection of systems and subsystems presents a new analysis and evaluation burden on the Army in terms of systems acquisition decisions as well as strategic and tactical decisions. New systems are being

considered, studied, and rejected or modified on a continuing basis. To date, the Army has not developed an adequate set of evaluation tools or concepts to support making comprehensive assessments. The problem is further complicated by the number of diverse groups which are addressing different facets of individual systems problems. These studies, related to specific assessment or design issues, are often independent of the total system evaluation issues.

The value of new weapon systems, doctrine, tactics, or training depends on their contribution to overall combat effectiveness of the integrated force. Studies which require system, force structure, or tactical comparisons make extensive use of force-on-force models to estimate combat effectiveness of alternatives. The Review of Army Analysis Study recommended in 1979 that a hierarchy of new combined arms and support models be developed to provide comprehensiveness and consistency in Army studies. This recommendation was approved by the Joint SELCOM (Select Committee) and promulgated in Army Regulation 5-11.

The Army Model Improvement Program Management Office (AMMO) is managing the development of the hierarchy of models. Two agencies are participating in the development: the Concepts Analysis Agency (CAA) is developing a theater-level model called FORCEM; the TRADOC Operations Research Agency (TORA) is developing the corps/division level model called CORDIVEM, and the battalion-level model called CASTFOREM. To date, CORDIVEM has been developed as an interactive simulation. Although contractual efforts are underway to automate some of the command and control ( $C^2$ ) representations in CORDIVEM, a decision has not been made concerning the development of a separate, fully automated corps/division level model. A plan for the development of Automated CORDIVEM has been prepared by JPL.

Army organization descriptions and system descriptions with respect to the development of an Automated CORDIVEM are mixed in terms of levels of detail. Existing Army documentation provides a relatively complete identification of most of the current equipment items such as information support system equipment and lethal and non-lethal weapon systems. Recent

documentation, Functional Area Requirement Objectives (FARO), has been developed by the Army to describe the various elements of combat and their characteristics for both Red and Blue. These documents identify a major portion of the combat systems and their basic operation in combat. Other existing Army documents such as Tables of Organization and Equipment (TOE), and Field Manuals, provide additional data for weapon systems and for the support systems equipment. However, given the extensive set of all possible Army organizations and structures as well as the unlimited level of detail which could be used to describe them, the particular subset to be addressed in the Automated CORDIVEM must be identified.

Another development which supports combat system definition has been a joint AMMO/JPL effort to define the command and control functional objectives. That description provides a basic structure for describing the functions required for a combat organization or unit in a given functional area, for example, force control, maneuver control, fire support, intelligence/electronic warfare, combat service support, and air defense. It provides an organizing principle which, when combined with the particular command and control items and interactions provides an explicit definition of the command function and an explicit definition of the specific staff activities and relationships necessary to support the commander in accomplishing the unit mission. Such a process of definition is based on the application of specific criteria or mechanisms concerning the interactions and relationships of the physical elements. Identification and description of the criteria and its application provides the definition of the processes required for transforming command and control system descriptions into model descriptions.

Existing Army documentation does not address the interactions and relationships of battlefield items in as much detail as it does individual physical elements. Consequently, a primary emphasis in this requirement document will be on specifying the criteria and characteristics of those interactions. The identified criteria and characteristics shall be

developed in such a way as to permit derivation of the Automated CORDIVEM System Design Requirements.

### 1.3

### DOCUMENT STRUCTURE

The JPL Plan for Automated CORDIVEM identifies three key requirements areas: user requirements, combat system requirements, and functional requirements. Documentation of these areas represents the primary product for the problem definition phase shown in the Automated CORDIVEM Program Chart at Figure 1-1. This document is organized to reflect those principal areas. The user requirements section describes the way in which the Automated CORDIVEM will be used by three principal groups: decision-makers concerned with Army organizational design and system development; systems analysts concerned with developing that decision information; and model developers concerned with the modification and execution of the model in order to provide supporting data for analysis. The combat systems requirements section describes the universe of combat elements, the interaction of those elements, and the environment in which they operate. The functional requirements section defines the model functions, the system description detail with respect to the model functions, and the model interfaces with the hierarchy of Army models. The level of detail described reflects a balancing of user requirements and combat systems requirements. In order to achieve a balanced set of functional requirements which provides an equivalent level of resolution across all combat functional areas without excess detail, an iterative requirement description process is to be used. The development of a documentation structure identifying the critical elements and their interactions at the highest level is implicit in this approach. Further, the structure must allow for incorporating progressive levels of detail without restructuring the basic documentation. It must be suitable for direct application to whatever model design is selected.

User requirements serve as the primary driver for determining the resolution, application input, and output of CORDIVEM. Further, they provide guidelines and constraints on what constitutes a usable,

# ARMY MODEL IMPROVEMENT PROGRAM AUTOMATED CORDIVEM PHASES

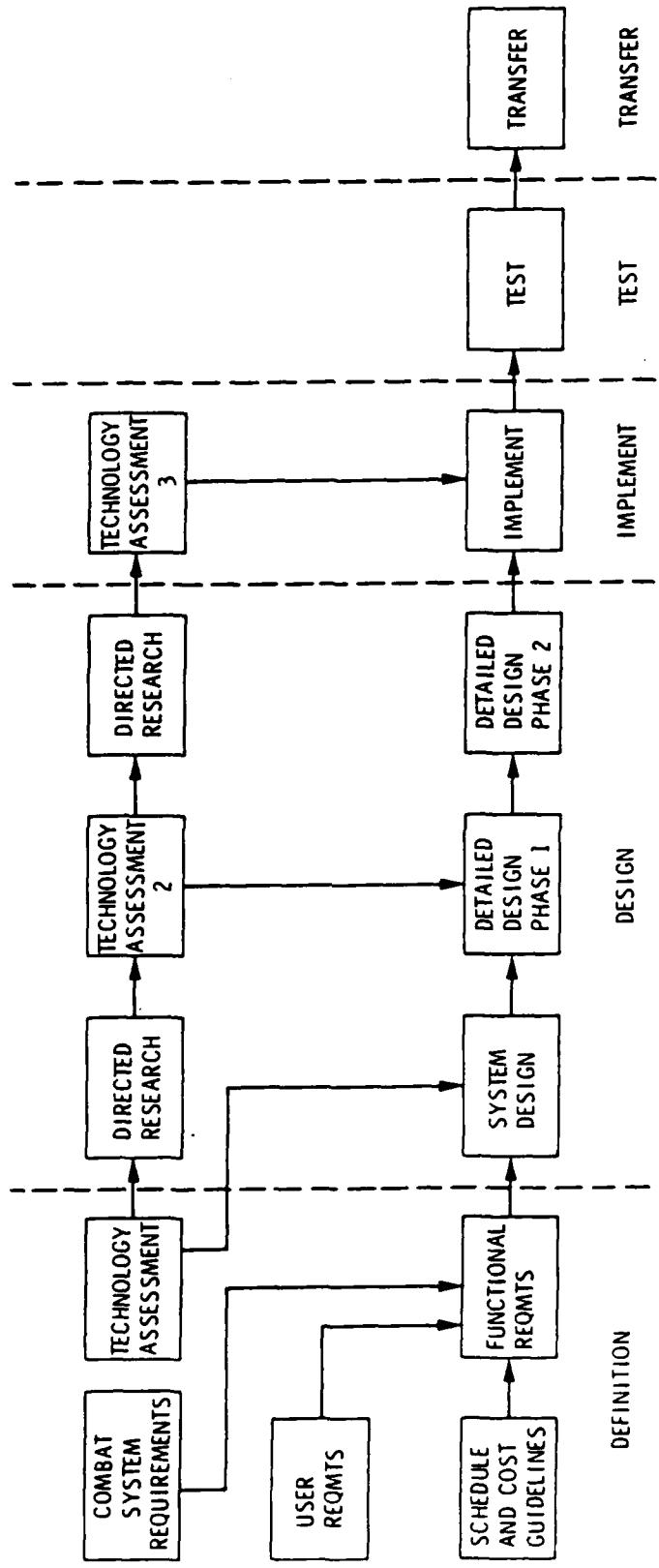


Figure 1-1

effective model for the Army analysis and evaluation community. Several existing Army documents provide guidance in the development of the user requirements, for example, Army Model Improvement Program Task 1-User Requirements, 31 March 1982; Army Command and Control Master Plan, 1982 Update; and Command and Control Evaluation Methodology Development Task Force Report, February 1982. These documents contain various levels and types of descriptions which shall be used as the basis for developing a general set of user requirements which can be particularized to support any specific study. Development of those specific requirements is broadly described as a successive process of (1) indentifying issues and objectives, (2) determining measures of effectiveness to support decisions concerning the objectives, (3) determining measures of performance to provide the measures of effectiveness, and finally (4) determining the level of resolution necessary for the particular model version to provide the identified measures of performance. The measures of performance are reviewed to ensure an equivalent level of representation in all model functional areas. This broad, generalized process must be balanced against the resource and response time constraints before a final requirement for a specific model version can be developed.

A clear, unambiguous procedure is required for translating user requirements into specific model functional requirements. For the Automated CORDIVEM Design Requirements, the following procedure has been identified and incorporated into the combat system requirements section.

The process for determining the model functional requirements is one of first identifying the particular command and control or combat items to be considered; second, identifying the command and control and combat interactions among those items; third, identifying the mechanisms by which the interactions occur; and fourth, identifying the specific factors which particularize the mechanisms for the specific item interactions. The descriptions of the factors and their representations are to be developed in the model functional requirements in terms of specific algorithms and

mathematical processes during the design phase. These factor descriptions define and describe the model information needed for each battlefield item.

The user requirements interact with the above process by providing limiting assumptions on each stage. For example, user study requirements will result in assumptions concerning particular weapon systems to be considered in the model. The assumptions will dictate which systems can be combined and which must be treated separately. Likewise, the user study requirements will result in assumptions that determine the significance of the interactions and thereby dictate which interactions can be legitimately ignored and which must be carefully considered. In a similar fashion, such assumptions will drive the selection of mechanisms, factors, and the descriptions of the factors. Specific definitions of terms and explanations of processes and procedures are presented in the appropriate sections of this document.

Functional requirements represent the final melding of the combat processes to be modeled or simulated, and the user requirements for analytical data. These requirements include the functional requirements for both the Automated CORDIVEM and the total software environment required to support it. These functional requirements are described for the model functions which will be used to design the actual computer code that will be implemented and executed and for the support functions which will aid in model modification, set-up, and execution. The model functions will necessarily represent all of the combat functions in such a way as to permit the derivation of analysis data; however, the model functions will not necessarily be identical to the combat functions. The model functions will be developed to accommodate an efficient means of supporting analyses of Army combat elements, not to accommodate a replication of the combat elements above. The process for developing functional requirements for Blue is the same as that for Red, although differences in resolution may exist.

## 1.4

### DOCUMENT UPDATING

The iterative process for developing the final set of functional requirements depends upon several considerations: the content and structure of associated model documentation; the processes for transforming system descriptions into model descriptions; the current state of related Army organization and system descriptions; and the need to actively manage future model changes. An assessment of these considerations will form the basis for decisions by the Army and JPL relating to the need for additional supporting Army documentation; the form to be used for model input; and the procedure for determining successive levels of detail to be incorporated into the Automated CORDIVEM development documentation. A well considered and well managed configuration control process must be developed to support the current documentation and to support the future model modifications necessary for analytical studies. The final section of the documentation addresses this area.

SECTION 2  
USER REQUIREMENTS

2.1 ANALYSIS REQUIREMENTS

The User Requirements serve as the primary driver for determining the scope, resolution, input, and output of Automated CORDIVEM. Further, they provide guidelines and constraints on what constitutes a usable, effective model for the Army analysis and evaluation community. The Automated CORDIVEM will be used by three groups: decision-makers concerned with Army organizational design and system development, system analysts concerned with developing that decisional-information; and model developers concerned with the modification and execution of the model in order to provide supporting data for analysis. Development of the user requirements can be broadly described as a successive process of identifying issues and objectives, determining measures of effectiveness (MOE) to support decisions concerning the objectives, determining the measures of performance (MOP) to provide the measures of effectiveness and finally determining the level of resolution necessary for the model in order to provide the identified measures of performance. The measures of performance are reviewed to ensure an appropriate level of representation in all model functional areas. The selected level of resolution, in turn, drives the content and description of the combat elements as contained in the combat system requirements section of the Design Requirements document. The actual model representation of the system elements are described in the Functional Requirements section of the Design Requirements document.

This overall process of developing user requirements is pursued with awareness of two major considerations. The Automated CORDIVEM is a dynamic tool which will be used for numerous types of Army analyses which will each contain additional, special user requirements. Therefore, various versions will be developed for the various studies, that is, the user requirements identify a simulation environment in which frequent model changes are the norm. These changes will result in computer code as well as data changes; however, each specific version must be identifiable in terms of

systems, interactions, and processes represented. The second consideration is that the Automated CORDIVEM is one model in a hierarchy of models to be used by the Army. As such, it must be amenable to interfacing with the other models while providing stand-alone results relative to the specific Corps and Division issues.

The following paragraphs discuss a broad range of identified Army issues which the Automated CORDIVEM may be required to address. These issues will be assessed to identify and scope the set of user requirements for the model. During the design of the basic Automated CORDIVEM, the full scope of requirements should be accommodated to the maximum extent possible. Detailed user requirements in terms of MOE and MOP must be developed and the basic model modified as necessary for specific studies.

#### 2.1.1                  Army System Decision Support

Limitations associated with current Army corps and division level models hinder comprehensive development of information to support decisions concerned with corps and division force design and employment. These limitations are associated with several areas, for example: general flexibility and speed (ability to investigate an adequate number of alternative scenarios, systems, and conditions); command and control fidelity (ability to represent an adequate level of corps and division command and staff functions); scope (ability to accurately represent the correct mix of systems and their interactions). The Automated CORDIVEM should support the development of useful, accurate information about the following:

##### 2.1.1.1                Force Structure Trade-offs

The basic issue is to maximize the combat effectiveness of the force within various resource constraints. Various weapon mixes, air assault mixes, and variations of brigade/division organizations, maintenance organizations, supply distributions, etc., need to be considered. Trade-offs need to be made among maneuver, combat support, and combat service support

assets in terms of numbers of battalions, numbers of weapon systems, and amount/mix of intelligence systems. These trade-offs must be made in the total context of Corps operations and incorporate the essential components of the various system interactions. Incorporation of the essential components implies addressing all aspects of Airland Battle 2000: the electronic battlefield to include jamming, homing systems, intelligence gathering, communications, command, and control; new technology systems such as fire and forget systems with passive seekers, unmanned weapon systems, and directed energy weapons.

#### 2.1.1.2        New Systems Acquisition

Of interest is the measurement of the combat effectiveness of new corps or division level item system assets, either a new class of systems or an improved system. Measurement of the combat effectiveness of such systems focuses on those aspects of the systems as they relate to the corps. That is, the representation of the system performance may be aggregated in terms of direct fire effects, but will provide direct measurement of corps/division related issues, for example, supportability and how that influences total corps/division effectiveness.

#### 2.1.1.3        Changes in Doctrine, Tactics, and Training

The related issues are concerned with such items as second echelon interdiction, control of the separate brigade, nuclear employment, resource allocation, force organization, interface with theater and adjacent corps, intelligence collection and dissemination.

#### 2.1.1.4        Types of Issues

The following list of issues is representative of issues likely to arise in the immediate future at the corps/division level of analysis. They can be expanded by referring to current study directives and plans. Issues of this type provide the basis for determining the measures of

effectiveness to be provided by Automated CORDIVEM. Performance factors for individual systems and components are determined by other means: item level tests, operational tests, performance area models, etc.

2.1.1.4.1

Force Command, Control, and Communications

- 1) What contribution does satellite relay support make to tactical communications?
- 2) What is the effectiveness of alternative organizational and operational plans for rear area combat reconstitution?
- 3) What effects do training, fatigue, and variation in human response have on the effectiveness of commands, staffs, and operators?
- 4) What is the relative combat effectiveness of different means used to ensure the continued operation of C<sup>2</sup> in degraded modes? Should technical solutions be incorporated in systems design and development, or in product improvement, as appropriate; or should other solutions be adopted through organizational and procedural changes, such as dispersed or distributed command posts?
- 5) How should different functional areas (for example, fire support and air defense) be linked?
- 6) What is the relative combat effectiveness of alternative doctrine, tactics, and procedures, versus acquisition of new equipment?

- 7) What is the effectiveness of alternative operational C2 processes and procedures implemented within realistic TOE personnel and equipment constraints?
- 8) What effect does jamming of friendly C<sup>3</sup> systems have on friendly force combat effectiveness? How effective is enemy jamming? What countermeasures can be employed?
- 9) What trade-offs between C<sup>3</sup> systems and firepower systems would produce a more combat effective friendly force?

#### 2.1.1.4.2

##### Close Combat

- 1) How does the use of nuclear and chemical weapons affect conduct of offensive and defensive sustained operations?
- 2) What is the impact of uncertainty of nuclear release on scheme of maneuver?
- 3) What is the optimum alternative role of Army aviation in supporting the maneuver commander? Should this role include deep interdiction?
- 4) What is the relative effectiveness of alternative doctrine for the Air Land Battle to exploit capabilities of maneuver forces?
- 5) Can the deployability of armor and mechanized forces be accomplished entirely by sealift with new type carriers within a reasonable time frame?

- 6) What is the relative effectiveness of alternative mixes of weapons for light/heavy forces?

2.1.1.4.3      Fire Support

- 1) What is the relative combat effectiveness of alternative concepts for engaging different target types at different ranges and rates?
- 2) What will be the potential effectiveness contributions of proposed weapons systems to be fielded between 1986 and 1995? What fire support deficiencies still remain?
- 3) What is the relative effectiveness of alternative CSWS (Corps Support Weapon System) units organized and employed on the battlefield? What are the force structure implications of each?
- 4) How survivable are the fire support means available to the Corps/Division? How effective are enemy air/missile defenses against each?
- 5) What is the most effective alternative means to accomplish second echelon interdiction? What percent of available fire support assets can be diverted away from the FLOT to attack second echelon forces? Is this an effective and prudent tactic?
- 6) What is the preferred alternative mix of nuclear, chemical and conventional weapons (by type and quantity) for close-in support, counter-fire, and interdiction?

- 7) What is the relative effectiveness of alternative fire support requirements for the Rapid Deployment Joint Task Force?
- 8) What is the relative effectiveness of alternative numbers of ground designators in each Fire Integration Support Team?

#### 2.1.1.4.4

##### Air Defense

- 1) What is the effect of alternative trade-offs of divisional air defense assets versus corps general support air defense battalions?
- 2) Is a SHORAD system capability required to support the missions of light infantry/airborne/airmobile divisions and, if so, what is the most effective alternative?
- 3) What is the preferred mix and quantity of divisional SHORAD and MANPAD systems in the light infantry/airborne/airmobile divisions?
- 4) What is the relative effectiveness of alternative sensor requirements for Army Air Defense (AD)? Should Army AD be linked to Air Force sensors and to the Battlefield Data System (BDS)? Should Short Range Air Defense Systems (SHORADS) be linked to the sensors of High-to-Medium Air Defense System (HIMADS)?

- 5) Is the lightweight air defense gun required, as a component of the air defense family, to support the light infantry, airmobile or airborne divisions in the near time frame?
- 6) Can a medium range LOAAD system provide adequate complementary defense for these divisions or is the HIMAD system essential (considering AF contribution)?

#### 2.1.1.4.5

##### Engineer Support

- 1) What is the effectiveness of alternative types of minefields in terms of delay, mobility kill, and firepower kills?
- 2) What are the effects of Red mines on Blue forces with and without early warning of mine presence and then with and without various types of minefield breeching equipment?
- 3) Identify the engineer organization and equipment implications attendant to the increased mobility support needed on the integrated battlefield.
- 4) What is the value of attaching engineers to task forces at various levels?
- 5) What is the relative effectiveness of alternative nuclear and chemical decontamination concepts?
- 6) What quantity and type of mines can be emplaced in a corps area during a 180-day battle?

- 7) What combat power increases are achieved by equipping all combat engineer units with armored vehicles?

#### 2.1.1.4.6

##### Logistics Support

Realistic logistical constraints and representation of all classes of supply are essential to address force structuring and trade-off decisions. Typical issues are as follows:

- 1) Is resupply to key combat elements adequate in terms of numbers and mix of items and timeliness of delivery for alternative resupply concepts?
- 2) What are the relative improvements in the alternative ATP/ASP concepts to improve resupply processes in the different contingency areas?
- 3) What is the relative effectiveness of alternative concepts for battlefield recovery of damaged vehicles and weapons?
- 4) What degree of attrition is inflicted on friendly resupply vehicles and from what source?
- 5) What are the significant problems related to the replacement of personnel and major end items?
- 6) Do commanders receive reports of the status of their units in time to perform successful reconstitution actions?
- 7) What are the implications of nuclear and chemical weapons employment on reconstitution?

- 8) What is the relative effectiveness of using or not using helicopters to provide logistical support to front line units?

2.1.1.4.7      Personnel Support

- 1) Should personnel support be standardized at corps level and/or division level? Can the geographical support concept used at corps level for non-divisional units be employed at division/separate brigade level?
- 2) Is unit replacement a more effective technique to respond to MACRO losses than individual replacement to disabled units?

2.1.1.4.8      Intelligence Support

- 1) What is the capability of the corps, division, and brigade surveillance and intelligence activities to accomplish their mission on the integrated battlefield?
- 2) What are the critical intelligence nodes and links and how secure are they? What is the relative effectiveness of alternative networking technologies to reduce their vulnerability? What means can best enhance CP survivability; options include: cellular CP, dispersed CP, hardened CP, signature reduction, size reduction, and electronic deception?
- 3) What is the relative effectiveness of alternative concepts for data exchange between systems in order to satisfy commanders' information needs? What is

the minimum data limit such that commanders, operations, and communications networks are not overloaded?

- 4) What is the relative effectiveness of alternative automated systems and processes to fuse tactical intelligence, target acquisition, and combat data into information useful to commanders?
- 5) What is the relative effectiveness of alternative sensor systems at corps and division levels to perform the joint intelligence mission?
- 6) What is the effectiveness contribution of a single or group of sensors by echelon?
- 7) What is the appropriate alternative mix of intelligence, artillery, aviation, FSE, people in a targeting cell at corps and division?
- 8) What is the most effective alternative information (intelligence) inputs for the commanders' decision making? Which are more useful than others?
- 9) What redundancy of processing and communication is required to ensure delivery of adequate intelligence to decision makers on a timely basis?

#### 2.1.1.5

##### Responsiveness

Existing combat models do not satisfy all user needs. Often the time and manpower required for scenario set-up, input data preparation and model verification or authentication, run time, and output analysis are so great that study alternatives may be examined in only a few tactical

situations and for only a few performance variations. Army decision making is centered around study processes such as cost and operational effectiveness analyses, and mission area analyses whose initiation precede major Army and Defense system acquisition reviews by approximately one year. Many force-level analyses are performed on an annual basis commensurate with the budget cycle. Major program requirement updates such as the Army Command and Control Master Plan are required every two years. Given the requirement to fully investigate all aspects of a given set of issues, application of the full complement of the hierarchy of models may be necessary. Automated CORDIVEM must be able to produce timely results which can be efficiently integrated with the total analysis process.

#### 2.1.1.6      Flexibility

Automated CORDIVEM must be able to investigate alternative systems, forces and doctrinal concepts in any region in the world under the full spectrum of anticipated environmental conditions including the integrated battlefield. Combat in cities, jungles, the desert and the arctic should be played with facility. There must be the capability to examine and readily assess alternative operational concepts, tactics, and formations.

#### 2.1.1.7      Consistency

Battlefield functions (e.g., field artillery) will be represented in FORCEM, CORDIVEM, CASTFOREM and the (fire support) functional area model. The level of detail represented will differ among models - hence common algorithms and common data may be minimal - but consistency in functional representation (both in methodology and data) must be maintained. Within the resolution constraints, changes to order of battle, tactics and weapon system performance should produce similar results at each stage of the model hierarchy. This will facilitate the aggregation of battle outcome data and its passage up the hierarchy as well as support the validity of trade-offs among functional area assets.

#### 2.1.1.8

#### Cause/Effect Determination

Automated CORDIVEM must permit clear understanding by the user of why outcomes change when parameters are varied. It must be possible to determine by analysis of model output the effects of changes in weapon system performance, and changes in organization and tactics on combat effectiveness and support requirements. A graphic portrayal of the battle as it unfolds may be an important aid to interpreting model outcomes.

#### 2.1.1.9

#### Time Period Simulated

Automated CORDIVEM duration must be sufficient to stress all corps and division functions to include all aspects of combat service support: reconstitution, battle support, and personnel replacement and evacuation. The relationship between control, command, communication and battle outcome must be accurately portrayed.

### 2.1.2

#### System Analysis Support

Army analysts are responsible for developing the necessary data and information to support Army management decisions concerning Army systems design and organization. Therefore the analysis and evaluation issues are closely related to the decision issues (contained in Section 2.1.1) in that they are concerned with ensuring that as complete and accurate a set of information as possible for the decision maker is provided by the analysis.

#### 2.1.2.1

#### Study Context

The proper context for the study must be established by:

- 1) Identifying the necessary scenarios, timeframe, mission profiles, and threat. Implicit in this

process is the user requirement to adjust the model to accommodate any changes from the basic model representation.

- 2) Reviewing the specific program or system decision issues to ensure that the correct problem is being addressed, and that the appropriate measures of performance (MOP) and measures of effectiveness (MOE) are identified. The effectiveness of each system or alternative must be measured on the basis of its contribution to the accomplishment of the tactical or strategic mission of the force under consideration which is utilizing that system or alternative. While the measures of effectiveness relate to the overall combat results achieved by the Army unit under study, the measures of performance relate to the manner in which the individual subsystem and elements contribute to those total results.
  - a) In general, the MOE for assessment are all related to a few major items: ground gained or lost; mission duration (time to accomplish the mission); friendly and enemy attrition; forces used (ability to allocate and apply forces); force ratios achieved (ratios of RED to BLUE forces); consumables supplied and consumed; and the force status (ability to conduct further operations). Although these measures are present in any good representation of combat, their utility for assessing a given system is dependent upon the degree to which they support the description of mission accomplishment. Most importantly, the MOE should be the same for all types of systems and thus provide a means for

comparisons and trade-offs with other systems. Table 2-1 provides a suggested set of MOE.

- (1) Secondary MOE or MOP should be developed as a function of the particular user issues for a given study. For example, issues concerned with air defense assets would result in comparing alternative air defense systems. A ranking of these alternatives would require comparison of the major MOE just as a study of armor systems would. However, the air defense study would require assessment of the specific assets defended by air defense in terms of their relative contribution to the major MOE. In contrast, the armor system study might note vulnerability to air attack but would not require that variation in air defense be considered.
  - (2) Specific new model representations may be required to provide suitable resolution for the selected secondary MOE and MOP in a given study. The model structure should provide a clear audit trail of the significant interactions resulting from resolution changes.
- b) The role of C<sup>2</sup> in the model representation, application, and interpretation is particularly critical. Representation of C<sup>2</sup> is essential to the overall model representation due to the significance it has for combined arms combat. That representation is necessarily more tenuous

	<u>Measures</u>	<u>Remarks</u>
1.	Mission Accomplishments	Scenario dependent, stopping RED main attack, destroying attacking force, defending for X-days, etc.
2.	Ground Gained or Lost	Determined by critical sector(s)
3.	Mission Duration	Time to accomplish or fail mission(s)
4.	Attrition	RED and BLUE weapons, support systems, command and control elements, etc.
5.	Force Ratios Achieved	Final force ratio in critical sector.
6.	Forces Used	RED and BLUE bns and other forces committed to battle.
7.	Supplies/Ammunition Expended	Major items: tank, TOW, artillery, POL.
8.	Force Status	Unit strength and location at end of battle; supplies on hand.

Table 2-1. Measures of Effectiveness

than the weapons and mechanical systems representation. Further, due to the discrete nature of the tactical decision making process, its effects are more prone to producing dramatic swings in battle outcome (just as in actual combat). Therefore, regardless of the purpose of the study, the influence of C<sup>2</sup> must be understood and factored into the total analysis. The MOP for C<sup>2</sup> related items should be carefully identified. Just as with weapon systems, studies directed toward C<sup>2</sup> may require developing special purpose MOP or aggregating existing data in a particular manner.

- (1) The MOP for C<sup>2</sup> assessment are divided into several layers with regard to the tactical decision process. They are selected so as to explain and clarify the effectiveness data by providing a clear audit trail of how and why decisions were made as a function of the C<sup>2</sup> system performance. Further, the careful and detailed analysis of these MOP is necessary to identify potential changes in system, organizational, and operational plans to provide insights on systems to decision makers, and to ensure correct representation of the total C<sup>2</sup> system operation. Table 2-2 provides a suggested set of MOP.

The first layer of MOP addresses the quality of specific information which is

<u>Measures</u>	<u>Examples</u>
Level 1: Quality of Decisional Information	Perceived Situation Enemy Intent Delays in Critical Events
Level 2: Quality of Staff Processing	Time Delays and Manpower for: Estimates, Orders, Resource Allocation, Coordination
Level 3: Efficiency of Data Handling	Message Preparation Message Quality Communications Availability
Level 4: Performance of Data Source/ Parameters	Detailed Performance Characteristics: Communications Equipment Delays Detection Probabilities Sensor Coverage Transmission Rates

Table 2-2. Measures of Performance

provided by the several staffs to the various commanders. The MOP include such items as the quality of the perceived friendly and enemy situation (identification, location, status, strength, activity); the accuracy of knowledge of enemy intent (direction, location, timing, size of enemy attack); the delays in timing (time of enemy attack); the delays in recognizing critical events (second echelon commitments, first contacts, weakened or destroyed friendly units, resupply needs), etc.

The second layer of MOP addresses the staff processes which provide the information to be used by the commander in making decisions. The MOP include such items as the time delays and manpower required to produce estimates of the situation, plans, orders for movement, maneuver and resource allocation, and coordination processes.

The third layer of MOP addresses the data handling and communications which provide the input to the staff processes. The MOP include such items as the message preparation and handling delays; quality of messages and products; and communications availability.

The fourth layer of MOP addresses the detailed performance characteristics and

features of the data sources. The MOP include such items as the communications equipment characteristics and delays; automated data processing characteristics and delays; combat element reporting criteria thresholds and delays; ground station performance and reporting criteria; detection probabilities/ranges; movement rates; sensor coverages; transmission rates; system vulnerabilities; etc.

#### 2.1.2.2 Model Representations

The particular MOE/MOP determine the specific assumptions which are applied in restricting the representation of C<sup>2</sup> and battle interactions and effects as described in Appendix A of this document. Specifically, the assumptions concern the degree to which similar equipment can be grouped; the interactions of items which can be ignored; the factors which can be ignored; and the descriptions which can be simplified. Coincident with these efforts is the requirement to identify the sensitivity studies which bound areas where data or information cannot be adequately obtained in order to limit the necessity for other assumptions. The Automated CORDIVEM documentation structure as well as the model must accommodate such analysis activities in the timeframe allowed for the total study process as noted in Section 2.1.1.

#### 2.1.2.3 Input Specification

Virtually all analyses using the model will require defining and incorporating new engineering system performance data and representations or defining and implementing the necessary human factors representation. The human factor representations will include parameters for a variety of items: man/machine interfaces, intelligence aggregation and creation, cognitive processes, operations data handling, communication handling, morale, fatigue,

and training. Changes should be accomplished by data input to the maximum extent possible.

2.1.2.4            Tactical and Operational Decision Processes

Both the model documentation structure and the model code must accommodate changes to the C<sup>2</sup> decision processes and the associated information categories and data elements which support the identified decision types. The changes should be accomplished through data changes.

2.1.2.5            Organizational and Operational Plans

Both the model documentation and the model code must accommodate changes to the Organization and Operational Plan through data changes.

2.1.3            Model Authentication

Senior level Army personnel concerned with Army system design and development decisions do not have the time nor the resources to assess the validity of model results which are used to support their decisions. These decision makers must rely on qualified military experts to assess model validity for purposes of supporting the particular issues. Given the inevitable large size and complexity of the Automated CORDIVEM, a totally complete and comprehensive assessment is not feasible for each study. Therefore, a less comprehensive assessment process must be developed. This process must provide a full overview of the model behavior and allow detailed assessment in selected areas. In particular, the model must either be intuitively satisfying to the military expert or provide sufficient information to establish its validity as a logical consequence of the model structure and inputs. Such a process of military authentication is assisted by clearly identifying model assumption, limitations, constraints, and by incorporating adequate traceability for model actions. These model and documentation features support testing of the model.

The true test for military authentication of any combat simulation should be capability of the model to accurately represent the effects of the application (or lack thereof) of the basic principles of war. "Doctrine and tactics" are the manifestation of these principles for a given situation (mission, threat, environment, weapon systems, etc.). Since commander decision is a critical event influencing combat outcome, it is essential in force-on-force simulation that the modeler understand and realistically represent these principles. To this end, the following discussion of each principle of war with respect to model authentication is provided. Automated CORDIVEM must incorporate these principles:

1) Objective

Every military operation should be directed toward a clearly defined, decisive, and attainable objective. Simulations must provide both friendly and enemy forces and their component units with a single, overall objective. All analyses of courses of action generated in the simulation must consider the risk to the objective as well as potential combat outcome. All orders must be attainable, decisive, and contributory to the ultimate achievement of the objective.

2) Offensive

A combat force must seize, retain, and exploit the initiative. In simulations, forces must be capable of perceiving an apparent advantage in the combat situation at any echelon that is modeled and the commander and staff must be authorized to initiate immediately the necessary actions to conduct and/or continue an attack. In this context, as situational changes occur, potential courses of action should be analyzed by the staff and subsequently initiated with

offense operations taking precedence over defense operations. Defense postures should be considered temporary stations where forces await the opportunity to seize the initiative. Additionally, it is imperative that forces in the model react realistically to the influences of opposing forces.

3) Mass

Combat power must be concentrated at the decisive place and time. In simulations, forces must be capable of initiating actions that allow increased density of those weapons engaging opposing forces. As a minimum, this increased density should be accomplished through coordinated multiple unit movement, reinforcement by additional forces and fires, and/or contraction of areas occupied. Increased density should result in a higher kill rate for the involved units. Although massing can provide the opposing force with a target-rich environment, the susceptibility of units being defeated through piecemeal commitment is reduced. Essential to modeling this principle are (1) the requirement for the various sized, representative units to occupy realistic areas in the simulation, and (2) a realistic representation of the command and staff coordination and control problems for a joint movement or fire direction of multiple, smaller units.

4) Economy of Force

Minimum-essential combat power must be allocated to secondary efforts. The corollary of concentrated combat power is economy of forces. This principle requires the modeled forces to decrease the density

of weapons capable of engaging opposing forces by expanding the occupied areas, or by lateral or depth dispersal. This should result in a lower kill rate for the involved units. Although a unit may be more vulnerable to defeat when committed by piecemeal, its attrition rate should be reduced because of target paucity in a given area. Essential to modeling this principle is the requirement for the command and staff to be on guard constantly to prevent decisive engagement of units performing in this role and to be prepared to alter their missions and/or support.

5) Maneuver

Another principle of war is that of placing the enemy in a position of disadvantage through the dynamic application of combat power. The lowest echelon forces represented in the model must be allowed to conduct independent, variable direction movement and attack with various orientations. The degree to which the simulation represents maneuver will impact greatly on the degree to which the simulation can apply the principles of mass or concentrated combat power, and economy of force. It is the positioning of units through movement and the varying of their sizes and orientations through strength adjustments and formation changes that form the basis for studying the dynamics of the battlefield. Essential modeling characteristics also require representations of weapon systems in variable formations and interfaces of these systems with the terrain to realistically depict the relationship of movement to fires. Staff and command elements must constantly attempt to fuse information into an up-to-date and accurate picture of the battlefield in order to

visualize the dynamics of the battle and anticipate and estimate future maneuver and resource requirements.

6) Unity of Command

For every objective, there should be unity of effort under one responsible commander. Simulation of the chain of command for the forces must be realistically echeloned with subordinate command elements adhering to their higher command concept of the operation. Subordinates must be limited in their options when responding to changes in the combat situation. Arbitrary or capricious actions by subordinate forces should be allowed only to the degree known to exist for a given nationality; this is an essential modeling characteristic. Independent actions on the part of subordinate commanders should be limited to their current mission, scheme of maneuver or area of operations, and fire control procedures and constraints. When analyses of courses of action indicate the need or opportunity for a change in mission or resources, an appropriate request for these changes should be sent to the higher commander.

7) Security

The enemy must never be allowed to acquire an unexpected advantage. All forces at each echelon in the simulation must be allowed to assume protective postures consistent with the activities being conducted. These postures should degrade the capability of the opposing force to find, fix, or fight the specific force. All pertinent signatures associated with given activities should be represented in the model in order to generate command

and staff perceptions (or deceptions) of enemy situations and intentions.

8) Surprise

The enemy must be struck at a time and/or place and in a manner for which he is unprepared. Security and surprise taken together require that simulated forces possess inherent detection and signature profiles. As a corollary to security, simulations must not only incorporate the appropriate advantages and/or disadvantages associated with protective postures and the signatures associated with its various activities, but must also realistically portray the advantages of increased or specialized sensings.

9) Simplicity

Clear, uncomplicated plans and clear, concise orders ensure thorough understanding. Force constraint on freedom of actions, required coordination, and implementation actions for operations at each echelon represented in the simulation should be directly proportional to the complexity of the order or plan. Appropriate time delays for these actions at each critical node are to be essential modeling characteristics to be incorporated into the operation.

#### 2.1.4

#### Analysis Requirements - Summary

The modeling and simulation implication of the Analysis Requirements presented in the previous paragraphs of this section can be grouped in terms of model scope, model resolution, and balance of model representations. A summary discussion of the general implications is

presented here in order to facilitate and to clarify issues which must be resolved before initiating model design and implementation.

#### 2.1.4.1

##### General Observations

The primary purpose for the development of the Automated CORDIVEM is to provide a tool for analyzing and evaluating alternative Army systems and concepts and architectures at the corps and division level. Specifically, the tool is required to measure combat effectiveness as a function of performance. Consequently, the model must provide a mechanism for linking the outcome of two-sided battles with variations in the behavior of the individual components engaged in those battles. The mechanisms for the linkages can be assessed in terms of scope and resolution. Resolution refers to the depth of detail in the simulation; high resolution implies very detailed and accurate processes, and low resolution implies less detailed processes in which more effects have been aggregated. Typically, the simulation designer experiences pressure to keep increasing the resolution by adding more and more detail because of the ever-present standard of the "real world". In the simulation equally important requirements for breadth or scope compete for resources and make it necessary to limit the resolution in all areas of the model. It is important to realize in this limiting process that an approximate balance in the level of resolution throughout the model is desirable for a very practical reason. Any significant gain in fidelity of one function is usually lost in the interfaces with other functions using coarser approximations and aggregations. The apparently high resolution of a particular function may give a misleading impression of the accuracy of the overall result. It is the overall result obtained from considering the essential interactions at an appropriate level of detail in the proper context that is critical to providing valid analysis data.

The smallest organizational unit to be considered in the simulation is a significant descriptor of the overall simulation. Whether it be division, battalion, platoon, or individual weapon, detailed effects below the lowest level echelon resolution cannot be represented explicitly. Studies

requiring such effects must provide for that part of the analysis from sources other than the model.

The resolution of the representation of the environment is typically defined in terms of the size and shape of an area within which the descriptors of the environment remain constant. The environmental cells are usually squares, hexagons, or rectangles. The selected size should be based on the detail of the maneuver effects required to do the studies balanced against the storage required to represent the total battlefield. Data storage depends on the size of the total battlefield and the required number of environmental descriptors. The design decision required to establish the environmental resolution must be made with great care because it dramatically influences the resolution of most combat effects and determines to a large extent which effects can and cannot be added to the model without major redesigns.

A fundamental characteristic of any simulation is its representation of time. Event-driven models apply situation considerations in scheduling events to occur at specific times and the resolution refers to the fineness (day, minute, millisecond, etc.) of its time scale. Time-driven models schedule all events to occur at a specified frequency and use situations to filter events which should not occur. The time resolution refers to the smallest time interval allowed. It is also possible to use a mixture of these approaches. In any case, the time resolution for C<sup>2</sup> in the model should be less than or equal to the fastest C<sup>2</sup> response required by the studies to be performed. For example, if the only decision processes to be studied affect the battle in a matter of hours, then a resolution of 1/2 or 1/4 hour might be sufficient. If the problem being studied emphasizes decisions which affect the battle in a matter of seconds, then a resolution of 1 second might be required. The decisions made when employing firepower (tanks, artillery, air defense, etc.) are typical examples of this fast response. Very often, the resolution of large models is such that these decisions must be made an implicit part of the pertinent combat processes. In this way, lower-level decisions are removed from the set of decisions to be

explicitly represented and such a model is limited to study of higher-level decisions and associated processes. Because of the nature of command and control processes, the correct representation of time-sensitive processes must be carefully and accurately accomplished. The foregoing example illustrates how the resolution in one fundamental aspect, time, affects specific features of the model. Automated CORDIVEM must allow for a variable time resolution in order to accommodate communications and sensor studies. These studies often require a very short time step. Examples of this include burst transmission and packet switching radios that will require less than one second resolution.

The level of resolution in system components refers to the degree of decomposition of a system into separate interacting functions. For example, a tank might be represented as a weapon system with aggregated values for lethality and vulnerability, or its various subsystems such as main gun, machine guns, sights, personnel, and radios might be represented separately. Each system considered for the model must be subjected to a simulation trade-off analysis to determine the appropriate resolution for the model and available resources. This encourages the designer to describe the level of detail of each system representation in addition to only stating that the system is represented.

Resolution in combat events is similar to that described for systems in that a wide range of level of detail is possible. The bare statement, "River crossings are simulated", means very little until the level of detail and the nature of the interactions with other functions in the model are known. In particular, the emphasis on C<sup>2</sup> requires that decisions, information requirements, and impact on combat associated with river crossings be specific in order to assess the importance of the simulation of river crossings to C<sup>2</sup> studies.

A fundamental issue for any combat simulation deals with its breadth in terms of the combat functions that are represented. The model should represent the Red and Blue weapons systems, command systems, sensor systems, support systems, and their interaction with the environment.

Further, it should represent the command and staff elements for Red and Blue forces with respect to the planning, control, and direction of the forces. The omission of any one of these areas is a significant limitation to the study of force-level issues.

Other limitations in the breadth of the model occur when representations of specific phenomena are omitted. The most common examples of such representations are related to various aspects of the environment: effects of variations in intensity of light (primarily night operations), weather, natural and man-made obscuration, nuclear effects, and chemical effects. Other such representations deal with the variations introduced by humans in combat: suppressive effects, errors in judgment, brilliant ideas, cowardice, heroism, fatigue, and attitudes toward the value of human life.

Simulated tactical decisions are the vehicle that translates staff performance into battlefield effectiveness. Staff organization, staff procedures, and communications at every echelon enhance or degrade the decision process and thus influence the employment of the systems that fight the battle. For example, delays can occur as a result of the C<sup>2</sup> facilities, processes, procedures, and communications. Improved performance in these areas results in more rapid reaction to battlefield events and more timely allocation of combat power, thus improved effectiveness. A general insight into how decisions can influence combat outcome is given here.

- 1) The modern combined arms doctrine is based on the assumption that the enemy will have far greater numbers, weapons at least as modern, and nearby supply sources. Commanders must know where and when to concentrate combat power. To be effective, commanders must be able to see the battlefield. They must be able to look ahead, anticipate future events, and act in the present to influence these anticipated events. Once forces are joined, it is all but too late for commanders to affect outcomes of most

engagements. The course of the coming battles is being decided in the present; each echelon of command must see ahead in order to have the time and space required to maneuver and allocate resources effectively.

- 2) To translate command and control into effectiveness, the simulation must allow each echelon to plan for future engagements. In the simulation, plans must coordinate maneuver, fire support, I/EW combat service support, and air defense. Each functional area can impact effectiveness in several ways.
  - a) Maneuver: The maneuver plan concentrates forces in critical places at critical times. It is designed to maintain or regain the initiative. A defense must allow for counterattacks in the defended sector which must be planned in detail. Attacks should be planned to strike weakness and avoid strength. The maneuver plan must also coordinate the movement of artillery, air defense artillery, engineer support, combat electronic warfare intelligence, and logistic units.
  - b) Fire Support: The fire support plan coordinates the employment of mortars, rocket artillery, tube artillery, and close air support. The support plan can effectively support the maneuver plan by rapidly massing firepower and attacking enemy formations in depth without shifting maneuver units.

- c) Intelligence and Electronic Warfare: The intelligence plan coordinates and organizes the employment of intelligence-gathering systems in support of providing the commanders essential elements of information. The EW plan can complement the operation by deceiving the enemy, locating electronic emitters, and intercepting enemy transmissions.
  - d) Combat Service Support: Combat service support provides the resource for conducting continuous combat operations by resupplying expended resources and maintaining the availability of war materials.
  - e) Air Defense Artillery: Air defense artillery must be positioned to protect the most valuable assets of the maneuver commander.
- 3) The fundamental problem of modeling C<sup>2</sup> is faithfully representing the interactions between combat effects, information, and decisions. This problem is illustrated here in nature, if not in degree. Consider the combat effect that depends on the environment: artillery lethality with respect to targets in open, wooded, or urban terrain. Suppose the simulation selects targets based on information such as type, size, and range of the target, but not terrain. Suppose further that two different systems with different capabilities are being studied. The high-performance system might select a target which would normally provide the better result, but because of the wooded terrain, the lethality is degraded. The low-performance system might select a different

target which would normally provide a worse result but because of open terrain, the lethality is not degraded. The low-performance system might appear better in this case because not all the factors included in the combat effects were considered in making the decision. Such interactions introduce pseudorandom behavior into the measures of effectiveness and the significance of the aberrations increases with the significance of the combat effects that are involved.

#### 2.1.4.2

#### Scope

The overall scope required of the model is seen by considering the Army System Support issues. The most encompassing requirement is the "Incorporation of .... Airland Battle 2000". This requirement and its related issues dictate the following:

##### 1) General

- a) Representation of each threat Front and Army and friendly functional area of corps and division operations, for example, force control, maneuver control, fire support, intelligence and electronic warfare, combat service support, and air defense.
- b) Representation (or the potential for) of new technology systems as well as all nuclear, chemical, and biological weapons. All conventional ground and air weapons are included.

- c) Representation of all external corps and division interfaces with adjacent units and superior echelons.
- d) Representation of environments which represent virtually every conceivable theater of operations in the world.
- e) Representation of all corps and division types to include armor, airborne, mechanized, contingency, and infantry.

2) Implications

The complexities associated with this wide range of requirements is related to several items: the size of the terrain data base and its associated descriptors; the variety of systems, their interactions, and their descriptors; and the expansive range of possible strategic and tactical decisions. An efficient automated data management scheme and sufficient manpower can provide model input for terrain and environment without stressing state-of-the-art software or machine design or size. The problem arises with the system interactions and decision processes associated with the wide variety of forces and environments. An efficient, automated means for pre-model input processing must be developed to assist in developing the system descriptions and interactions. Further, an on-line, generalized, tactical decision-making process which operates from basic principles common to all military operations must be developed. This process currently does not have a military or commercial counterpart in computer

code. Its scope can be somewhat ameliorated by efficient handling of the descriptions and input of missions and operations plans. In turn, the development of these plans can be accomplished off-line with the aid of automated processes. Given the potential number of alternatives, the alternative of developing an a priori set of specific decision rules and thresholds for each new scenario or alternative system is clearly prohibitive in both time and expert manpower.

#### 2.1.4.3

#### Resolution

Both the Army System Support and System Analysis Support contain numerous issues which dictate two key resolution factors: company-level maneuver forces and individual messages for command and control.

- 1) Company-level maneuver forces are required in order to correctly and adequately represent the necessary general tactics as well as the tactics and effects of NBC weapons.
- 2) Individual messages for command and control are required in order to adequately represent the phenomena connected with the degradation, interruption, and reestablishment of communications associated with electronic warfare, contingency operations, destruction of command posts, and continuity of operations. Further, individual messages are required in order to assess virtually any command and control system alternative or to make assessments concerning trade-offs between command and control systems and weapon systems or to assess alternative concepts for enemy deep interdiction.

#### 2.1.4.4

#### Balance

Determination of the resolution and representation of most of the other items in the model are driven by the two items discussed above: maneuver companies and individual messages. Resolution of these considerations should precede discussions concerning environment, time increments, other system components, or combat events.

#### 2.1.4.5

#### Sizing

The user requirements provide the basis for assumptions which limit the number of required descriptions of model elements. The maximum number of descriptions without these limiting assumptions can be estimated by considering all possible combinations of the number of items, the number of interactions, the number of interaction mechanisms, and the number of factors. Assuming for battle interactions and effects: 50 items equivalent to "company level", 7 interactions, and 12 mechanisms with two factors each, there could be as many as 84,000 descriptions. Assuming for command and control interactions and effects: 5 commander levels, 5 staff elements, and 10 types of "forces"; 5 interactions; 11 mechanisms with 5 factors; there could be as many as 68,750 descriptions. Considering that for both battle and C<sup>2</sup> each description could be an algorithm or process as opposed to a single number, the potential model definition problem could be prohibitively large and complex.

- 1) Clearly, all items do not interact in all possible ways with all other items, however, this analysis demonstrates the potential model definition problem unless careful attention is given to the user requirements and their related assumptions.
- 2) By addressing the limiting assumptions and considerations, a precise definition of the model

limitations can be established. Further, the process of identifying the items and their interactions, mechanisms, and factors provides an accurate basis for sizing the final model prior to detailed design.

## 2.2

### PERFORMANCE

This subsection is primarily concerned with the model developers and their requirements for modification and execution of the model to provide supporting data for analysis. The requirements address the total simulation environment with respect to hardware and software. The emphasis in the requirements is on developing an efficient means for model maintenance which will satisfy the time constraints of supported analyses. The principal impact of these requirements will be felt during the system design effort when the actual computer program hardware and software support environment are designed.

#### 2.2.1

##### Runtime

The model shall run in 12 hours wall clock time executing 72 hours of battle time; it will not require human intervention.

#### 2.2.2

##### Model Operation

The model shall provide an operational environment which facilitates initialization, execution, and capture of analysis data.

#### 2.2.2.1

##### Set Up Time Limit

The model shall be set up for individual runs within a one person day. Modification of setups shall range from weapon system to complete scenarios. Method for performing set up shall be an interactive expert system which shall provide natural language dialogue to assist the user.

#### 2.2.2.2

##### Execution

The model shall be initiated by an authorized user from specified terminals. The model shall run without support until completion unless the user intervenes. Post run activities shall include verification of data base integrity, off-line loading of specified reports and retention and backup of specified files.

#### 2.2.2.3

##### Environment

Automated CORDIVEM shall run in a multi-user, multiprocessing environment with the capacity to switch data files and data bases as necessary to support concurrent execution of different scenarios.

#### 2.2.3

##### Resource Utilization

A minimum of special purpose support shall be required to operate and execute the model.

#### 2.2.3.1

##### Efficiency Requirements

Automated CORDIVEM shall execute in the required space using specified off-line storage and data base facilities.

#### 2.2.3.2

##### Personnel

Operation support shall require two people. The model shall be available on a twenty-four hour basis to perform analysis. Model turnaround shall be limited only by set up times and space availability on the computer system.

### 2.2.3.3

#### Hardware

There shall be sufficient resources available such that only non-interactive tasks need to be postponed to second shift operations. All interactive devices, such as graphics equipment, shall be such that the processors which support the model are not responsible for those tasks which can easily be supported in an independent device (such as refreshing of displays).

### 2.2.4

#### Reliability

Software and hardware failures shall absorb no more than 3% of possible run time. Model shall be reconfigurable to run without all modules should it prove necessary due to software or hardware failure. Validation of the model performance shall be accomplished using specified criteria established during model design. Sufficient backup and duplication of software and hardware elements shall exist to support restoration or relocation of the model and its data bases in the event of catastrophic failure of any element.

### 2.2.4.1

#### Hardware

Large scale integration technology is to be preferred over discrete components in order to minimize connections. Off-the-shelf equipment, especially that with a proven track record, is to be preferred over newly designed equipment unless performance or cost considerations outweigh the risk factors involved.

### 2.2.4.2

#### Software

The software design shall include extensive trace-back features to aid in both analysis and error detection.

## 2.2.5

### Maintainability

Two to five staff shall be provided to maintain this model. Data management shall be provided through centralized data base administration that will maintain maintenance rules, data locations, linkages, and the data element dictionary. Data security shall be provided by limiting user access, constricting user update controls, and maintaining transaction logs for relevant systems. Hardware shall be supported and repaired or replaced within 24 hours of failure for peripheral and 72 hours for CPU. Software shall be sufficiently modular with built-in logic tracing (where appropriate) to ease software error identification and correction.

#### 2.2.5.1

##### Hardware

All equipment shall be capable of being supported by the vendor and where mixed vendor equipment is deemed necessary, all components must be easily disconnected so faults may be isolated. It is preferred that off-line testing of equipment be available and repairs should be able to be implemented by exchanging boards rather than on-board repairs.

#### 2.2.5.2

##### Software

The support software for the model shall include automated development facilities.

## 2.2.6

### Modifiability

The model shall be modular in design to support modification of model configuration for analysis purposes. Functions shall be compartmentalized to support modification of model elements to change model to reflect changing user requirements. Compartmentalization of functions shall also assist in development of enhancements to model features and representations as necessary during the model's life cycle.

2.2.6.1            Hardware

Equipment that is acquired shall be able to interface to any model of the processor family without modification. This applies to both current and future models and thus requires that only interfaces supported by the vendor be used.

2.2.6.2            Software

Automated processes shall be provided to assist in establishing the impact of software changes.

2.2.7              Transferability

There is no requirement that the model be transferable between hardware types, computer language compiler, or different computer configurations.

2.2.7.1            Hardware

The ability to run tasks on any of several machines in the system requires that adequate networking equipment shall be available. In order that processes may be dynamically dispatched to processors, there is a need for multiple processor access to mass storage devices.

2.2.7.2            Software

The software shall use standard techniques which are not system dependent.

2.3 DATA TRANSMISSION REQUIREMENTS

2.3.1 Local Transmission

Local transmission requirements are 1/30 of a second response time for terminal communications.

2.3.1.1 Communication Protocols

Communication protocols shall conform to American National Standard Instruction (ANSI) standard.

2.3.1.2 Throughput

Throughput shall consist of 9600 baud transmission.

2.3.1.3 Security

To support classified and unclassified running of Automated CORDIVEM terminals shall be linked to a security system.

2.3.2 Remote Transmission

Communications shall be through a military communications net. Signal processing shall be performed to validate signal accuracy between stations. In the event classified data are transmitted, data shall be encoded and decoded.

2.4 GRAPHIC DISPLAYS

2.4.1 Generic Requirements

The following generic requirements shall be accommodated.

#### 2.4.1.1      Visibility

Graphic displays shall be visible from a distance of ten feet in ordinary room light; the capability of deploying multiple monitors with identical images shall be available. All display monitors shall be at least 19" in size with a minimum display resolution of 525 lines; resolution requirements shall be studied to determine if higher resolution is required.

#### 2.4.1.2      Display Modes

Graphic displays shall normally be in Red, Green, Blue (RGB) mode; the capability to display images in NTSC mode shall also be available.

#### 2.4.1.3      Archival Recording

All graphics display hardware shall be capable of being recorded on a video tape recorder for later playback and analysis as required. If resolution higher than 525 lines is determined to be necessary, then conversion equipment to enable recordings to be made shall be supplied.

### 2.4.2      Hardware

Graphics hardware shall be available off-the-shelf; no hardware development is expected. If any requirements give rise to designs not available off-the-shelf, then these requirements will be iterated.

#### 2.4.2.1      Interactive

Each display station shall contain one or more of the following devices:

Digitizing Tablet

Trackball

Mouse

Foot Pedals

Control Dials  
Function Switches  
Joystick  
Touch Panel  
Piano Keys

These devices shall be available to control menu selection, picking, and other activities. The specific choice of devices shall be made after study of project needs. It is anticipated that at most, one or two of the above devices will be required to serve the needs of the automated portion of the model development and model preparation.

#### 2.4.2.1.1      Post Processing

History files shall be maintained during model execution for post processing; displays shall be updated at intervals not to exceed one battle time minute during the execution of a run at the option of the model analyst.

#### 2.4.2.2      Interfaces

All interactive devices shall be interfaced either through the associated graphics display terminal or to the executing process via RS232-C lines to the host computer. The graphics display processor shall be a dedicated processor connected to the host computer by a high-speed line transferring data at a rate no less than 1.2 megabytes/second.

#### 2.4.2.3      Resolution

The minimum acceptable resolution is 512 by 480 visible pixels viewable if a raster display is used, and 4000 by 4000 points if a calligraphic display is used. A minimum of 64 colors shall be displayable in

a single image with a design goal of 256 colors. If realistic rendering of terrain is determined to be necessary, then a minimum range of intensities in monochrome shall be 256.

2.4.2.4            Response Time

The processor shall be capable of refreshing at least 250,000 pixels/second if a raster display is used, and 25,000 vectors/second if a calligraphic display is used.

2.4.2.5            Multiple Displays

The graphics processor shall be capable of displaying at least two distinct views of a given image on from one to six monitors.

2.4.2.6            Maintainability

All graphics display equipment shall be capable of being supported by a single vendor and where mixed vendor equipment is deemed necessary, all components must be easily disconnected so faults may be isolated. It is preferred that off-line testing of equipment be available and repairs should be able to be implemented by exchanging boards rather than on-board repairs.

2.4.3            Software

Graphics display software shall make maximum use of graphics equipment vendor-supplied and other vendor software to the extent possible.

2.4.3.1            Machine-Independent Interface

Host graphics software shall be developed using ANSI standards to the extent possible; either the Special Interest Group in Graphics (SIGGRAPH) Core Standard or the Interaction Standards Organization

(ISO) Graphics Kernel System shall be used if the ANSI Standard for graphics is not approved in time for development.

2.4.3.2        High-Level Language Support

Graphics programming required in the graphics display processor shall be possible in a high-level language; a cross-compiler shall be available to run on the host computer.

2.4.3.3        Concurrent Execution

The graphics display processor shall be capable of executing programs concurrently with the host without host support with the possible exception of graphics input devices connected to the host.

2.5              USER INTERACTION

The man/machine interface for the model shall accommodate both off-line and on-line access.

2.5.1            Hardware

The following hardware items are to be provided.

2.5.1.1          Devices

The standard device used for interaction shall be an alphanumeric computer terminal. The preferred terminal is one manufactured or supported by the host computer manufacturer but any compatible terminal may be used.

2.5.1.2          Standards

Terminals shall be ANSI X3.64 compatible.

2.5.1.3        Configuration

Terminals shall be configured using the RS232-C protocol. A single terminal shall be able to interface to any portion of the model even if networking is used to connect multiple computers.

2.5.1.4        Response Time

An alphanumeric terminal shall respond to a user input within 1/30 of a second.

2.5.1.5        Reliability

Terminals shall have an effective failure rate no greater than one per year. If a terminal is chosen that has a higher failure rate, then appropriate spares shall be acquired.

2.5.1.6        Maintainability

Terminals shall be capable of repair by board replacement.

2.5.2        Software

2.5.2.1        Menu-Driven Interaction

The standard mode of interaction shall be via a menu-driven system usable by both novices and advanced users. The standard operation of the system shall be via a tree structure with escape facility for experienced users.

2.5.2.2

Standard Module Interface

To support the menu-driven system, all software shall observe a standard module interface for parameter passing; inputs to a module shall be possible using the standard interface either interactively or via command files.

2.5.2.3

Standard Help Utility

A standard "help" utility shall be provided for instructions on how to use the menu-driven system, individual programs, and general capabilities of the host operating system. The utility shall be available to users both within the menu system and in individual programs. It is a design goal to provide help to the user "automatically", that is, based on the length of time elapsed waiting for a user input and an input received in error.

2.5.3

Operation

2.5.3.1

User Station

2.5.3.1.1

Configuration

The user station may be combined with the graphics display station or may be a distinct area. It is anticipated that there will be many more user stations than display stations.

2.5.3.2

Operating Modes

The user shall have the capability of interacting with the set-up module of the model as well as the capability of operating on the output of a run.

2.5.3.2.1        Post Processing

History files shall be provided to enable an analyst to evaluate the results of a run; graphics and plotting capability shall be provided. Trace back to model design shall be provided for each functional area of the model.

2.5.3.2.2        On-Line Monitoring

An analyst shall have the capability to monitor the progress of a run with intermittent alphanumeric and graphical displays.

2.5.3.2.3        Interrupt and Restart

A simulation shall be capable of being interrupted and continued at a later time.

2.6                RETENTION, RESTART, RECOVERY

2.6.1              Retention

2.6.1.1            Setups

Model setups shall be retained for a complete study period. Identified historical benchmark setups will be retained indefinitely.

2.6.1.2            Input Data Bases

Input data base retention shall correspond to setup retention.

- 2.6.1.3        Output Data Bases
- Output data bases are retained indefinitely until deleted by study staff.
- 2.6.1.4        Transitional Data Bases
- Transitional data bases are retained for 30 days maximum.
- 2.6.1.5        Analysis Files
- Analysis files are retained for 30 days, duration of study, or by user request.
- 2.6.1.6        Analysis Reports
- Analysis reports are retained the same as analysis files.
- 2.6.2           Restart
- 2.6.2.1        Job Failure
- Log files shall support restart of the model from checkpoints based on battle time in the event of software or hardware failure.
- 2.6.2.2        Staged Analysis
- Staged analysis shall be supported by user controlled model execution where user-specified time intervals or milestones are used to produce requested documentation reports and/or displays. The model shall stop and restart execution as specified.

2.6.3           Recovery

2.6.3.1       Backups

In the event of catastrophic failure at the system level, sufficient backup shall be retained to recover lost files and software.

2.6.3.2       Data Bases

Data bases shall be copied after each update and archived until the next successful update.

2.6.3.3       Transaction Files

Transaction files shall be retained 90 days after data base update.

2.6.3.4       Current Program

Copies of a current program source shall be archived for system recovery.

2.6.3.5       Procedures

Recovery procedure shall conform to data center standards.

2.7           ACTIVITY TRACKING AND LOGGING

2.7.1       Security and Privacy

To support security for classified studies, transaction logs shall be retained of user access attempts against model's software and data bases.

Attempts at unauthorized access shall provide identity of terminal location and the nature of access attempt.

Data base modification shall be restricted to authorized individuals and access shall be limited to specified terminals. Transaction histories shall be retained of modifications made to data bases by identifying modification mode and modifier.

#### 2.7.2 Analysis Support

Logs shall be kept of specific model functions necessary to validate model performance. Logs will provide time-lapsed synopsis of model activity including decision rule, mapping, maneuver activities, attrition, etc.

Software shall be provided to generate reports from the activity logs for use in Army analysis studies.

#### 2.7.3 Validation

Activity logs shall be used to benchmark model behavior for "classic" scenarios. These will be used to validate model repeatability.

Measures of performance (MOP) shall be developed to validate model behavior during system testing. Measures of efficiency will be developed to validate model performance. The MOP shall be traceable via automatic data base handling to the model design in each functional area of the model.

SECTION 3  
COMBAT SYSTEM REQUIREMENTS

3.1 GENERAL

This major section of the Automated CORDIVEM Design Requirements describes the universe of combat elements, the interactions of those elements, and the environment in which they operate. Central to the development of this section is the realization that a combat simulation model is developed for the purpose of examining the behavior of items on the battlefield as they interact with one another. By focusing on the interactions of the items rather than on the items in isolation, an efficient process for organizing and describing combat models is obtained.

This section defines the component elements of the process of describing the interactions and combat effects. Further, it describes the application of the process and presents the results of its application to the Automated CORDIVEM. Appendix A has been included as a reference which contains functional descriptions of the battlefield items and a general description of the battlefield dynamics that should be considered in a model. Specific objectives for the process include the following:

- 1) Completeness: Provide a clearly understood means for ensuring that the appropriate aspects of combat are considered in the Automated CORDIVEM. Implicit in this objective is the explicit identification of what items are and are not to be addressed in the model.
- 2) Balance: Provide a mechanistic approach for determining the balance in model representations among different component parts of the combat elements. Implicit in this objective is identification and description of all assumptions concerning combat representations. Further, in

determining the balance of representations, the specific data associated with each combat element is identified.

- 3) Simplicity: Provide a means for identifying combat element descriptions which can be developed and input by subject area experts who do not have a detailed understanding of the total model structure. Associated with this objective is the concept of the hierarchy of models and the linkages among them.
- 4) Efficiency: Provide a structure which is amenable to automated means of manipulation for review, assessment, and update.

### 3.2

#### IMPLICATION OF AUTOMATED CORDIVEM USER REQUIREMENTS

The primary reason for developing the Automated CORDIVEM is to provide a tool for analyzing and evaluating alternative Army systems, policies and organizations at the corps and division level. To accomplish this goal, Automated CORDIVEM must provide a mechanism for linking the outcome of two-sided battles with variations in the individual components engaged in those battles. Since it is infeasible to create a model which completely represents the real world, those elements of combat which are to be included in the model must be carefully selected. This selection process demands consideration of the analyses required of the model. Because the user requirements define the types of studies to be performed by the Automated CORDIVEM, the user requirements serve as the primary guide for determining the elements of combat to be modeled.

The Army Model Organization and Description Scheme (AMODS) developed for these requirements defines a combat systems syntax which classifies the items and interactions involved in combat. Within the AMODS classes, the user requirements for the model are used to specify the item

resolution and to identify interactions for modeling. The user requirements described in Section 2.0 of this document provide the foundation for the present application of the AMODS methodology. A summary of those user requirements follows to facilitate understanding of the subsequent review and assessment.

The modeling and simulation implications of the user requirements presented in Section 2.0 are grouped in terms of model scope, model resolution and model balance. Model scope defines those aspects of combat which must be incorporated in the simulation. Resolution refers to the level of detail in the model. Competition between scope and resolution for available computer resources necessitates limitations on the size of the model. To assure model accuracy, the user requirements specify that the model maintain balance among its component elements. The elements of a model are in balance with respect to a given parameter if the computer simulation of the interaction of those elements produces model results for the given parameter which correspond to the results of combining those elements in actual combat.

The smallest organizational units included in the model are significant descriptors of the resolution of the overall simulation. Detailed effects below the lowest level resolution echelon cannot be represented explicitly. Note also that effects caused by echelons above those modeled also cannot be explicitly calculated. For combat units, the user requirements imply simulation of maneuver units from corps to company level. Command and control units should be modeled with enough detail to permit simulation of individual messages.

The user requirement for "incorporation of ... Airland Battle 2000" defines the overall scope of the model. Modeling the Airland Battle 2000 demands that the Automated CORDIVEM simulate not only combat near the main battle area but also that the model represent operations directed against enemy units not yet in contact with friendly units. In this combat environment, target acquisition, weapons, and logistics must be integrated by

a command/control element capable of seeing the enemy second-echelon and of obtaining near real time combat intelligence. Simulation of the Airland Battle 2000 must include nuclear, chemical, and electronic combat. Finally, the model should have the capability to describe combat in virtually any theater of U.S. operations.

In the current application of the AMODS structure, specification of items and interactions reflects the user requirements. The AMODS format permits classification of maneuver units down to the company echelon. To allow for simulation of individual messages, the current study describes individual commanders and staff elements in the AMODS format. To assist the reader in interpreting the results of this review, a discussion of the AMODS procedure follows.

### 3.3 AMODS OVERVIEW

The AMODS technique defines two general item classes: battle items, and command/control ( $C^2$ ) items. By definition, battle items are those items that interact physically. Command/control items interact through cognitive activities (cognitive activities govern items' organizational relationships and the transfer of information or commands). In the AMODS technique, an interaction is a sequence of activities which an item performs for the purpose of bringing about a change in any other item's physical or cognitive state. To further specify the items, the AMODS methodology defines item groups for both of the general classes.

Since the physical state or activities of weapons, communication equipment, computers, supplies, depots, vehicles, weather, roads, troops, staff, commanders, etc. affect the battle outcome, the AMODS methodology classifies these items as battle items. The AMODS methodology divides these battle items into five groups: weapons system, command system, support system, sensor system, and environment. The inclusion of the command system as a battle item group provides for the representation of command post physical characteristics. In general, the processes of damaging, suppressing,

detecting, delaying, deceiving, supporting or communicating govern the interaction of battle items. Note that some battle items, such as weapons, primarily interact with enemy items; other battle items, such as commanders or vehicles, primarily interact with friendly items. Hence, as a class, battle items interact with both enemy and friendly items. Applying the AMODS methodology, the current review records all battle items and battle interactions addressed by the user requirements. The results of this cataloging process are shown in Tables 1 through 1.5 which are located in paragraph 3.7.

Items such as commanders, staff elements, liaison officers and the fighting forces perform essential cognitive activities and so the AMODS structure classifies these items as command/control items. For the C<sup>2</sup> items, the AMODS format identifies three groups: commanders, staff, and forces. Because personnel influence both combat and cognitive processes, a complete description of the role of personnel on the battlefield necessitates the inclusion of forces, staff and commanders in both the battle item and command/control item classes. By detailing the cognitive interactions, processes which organize, allocate, direct, inform or request, the AMODS format provides a means of tabulating the chain-of-command links addressed by the user requirements. The results of cataloging these C<sup>2</sup> items and interactions are contained in Tables 2 through 2.3.4. It should be noted that for both battle and command/control items, the corresponding tables contain several levels of resolution and so permit complete cataloging of all items identified in the user requirements. The Level 3 resolution for Battle and C<sup>2</sup> Items is not fully specified in this iteration of the Design Requirements. An accurate description at this level requires further specification and community approval of the Automated CORDIVEM User Requirements. Such further specification will provide the specific MOE and pattern of analysis to satisfy the User Requirements Issues shown in Section 2.0 of this document. Additionally, it will provide the MOP and data items that are necessary to construct the identified MOE.

The AMODS technique also provides a way to record the details which characterize how items interact and the elements of combat that stimulate or inhibit the occurrence of interactions. To further refine the dynamics of combat and cognitive activities, the AMODS methodology defines mechanisms as activities which, when performed in combination with other activities, result in the occurrence of an interaction. The AMODS identify several mechanisms, some involved in the occurrence of battle item interactions and others associated with cognitive interactions. Additionally, the organization scheme defines as factors those parameters which may influence the execution of mechanisms. Again, the AMODS methodology identifies a variety of factors, some modifying battle mechanisms and some detailing cognitive mechanisms. To clarify the distinction between interactions, mechanisms and factors, consider the following example. Again, an interaction is a process which brings about a change in an item's physical or cognitive state. Therefore, the statement, "a friendly tank damages an enemy tank", identifies the interaction of damaging. A more detailed description explaining how the friendly tank damages the enemy by first moving to position, then spotting the enemy tank, and finally, firing ammunition identifies the mechanisms of an interaction: sense, move, engage. Finally, note that a tank's maneuverability and lethality affect its ability to move and engage, so these descriptors define factors. A list of AMODS interactions, mechanisms, and factors, with definitions of these terms are contained in paragraph 3.6; mechanisms and factors are numbered for later reference.

Finally, following the format suggested by the AMODS technique, the current iteration catalogs as representations any particulars of the item/interactions shown in the tables. The a priori conditions for executing an activity; the effects that the enemy may have on the interacting item; and any additional consequences of performing an interaction are all recorded as representations. Continuing the example in the paragraph above, the effects of smoke and battlefield obscuration that result when one tank engages another are cataloged as a representation of the item/interaction. All mechanisms, factors, and representations are cataloged in directories, one

directory accompanying each table. For each item/interaction indicated in a table, the corresponding element (indexed by table row, table column) of the accompanying directory records the mechanisms, factors, and representations associated with the indicated item/interaction. Directories follow the tables.

### 3.4

### KEY TO AMODS TABLES AND DIRECTORIES

The AMODS battle item/interaction and C<sup>2</sup> item/interaction tables and battle and command/control directories have similar formats and follow the same hierarchical structure. Figure 3-1 shows the template for reading all AMODS battle item/interaction tables. Note that the numbered rows specify friendly (U.S.) Army battle items; the table hierarchy resolves these items as described below. Numbered columns specify both the interaction and the item with which the row specified item interacts. A slash in an item/interaction cell indicates that the indicated item/interaction should be addressed; the absence of a slash means that the indicated item/interaction should not be addressed. When an asterisk is located in the upper left section of the cell, the specified friendly item interacts with an enemy item. When an asterisk is located in the lower right section of the cell, the specified friendly item interacts with another friendly item. For example, in Figure 3-1, the symbol in row one, column one [cell (1, 1)] indicates that friendly weapons damage the enemy weapon system; the accompanying directory notes any particular threat weapons that are damaged by the specified friendly weapon. In Figure 3-1, the slash in cell (2, 34) indicates that elements of the friendly command system communicate with elements of the friendly sensor system. Specification of the item in the command system (a person) is accomplished by a table in the hierarchy with greater resolution; the corresponding directory records the specific item (a person) in the sensor system who receives the communication.

Figure 3-2 gives a similar key for the command/control tables. In Figure 3-2 the command/control table contains fewer rows and columns than the battle table because there are fewer command/control item groups and interactions. Also, this review, friendly command/control items

Figure 3-1 Key to AMDS Battle Item/Interaction Tables

**ROWS:** Specified friendly (U.S.) battle item.  
**COLUMNS:** Specified item with which ROW item interacts; ordered as follows:

classified by 39 columns, ordered as follows:  
 Columns 1, 6, 11, 16, 21, 26, 31: Weapons System item  
 Columns 2, 7, 12, 17, 22, 27, 21: Command System item  
 Columns 3, 8, 13, 18, 23, 28, 33: Support System item  
 Columns 4, 9, 14, 19, 24, 29, 34: Sensor System item  
 Columns 5, 10, 15, 20, 25, 30, 35: Environmental item

INSTRUCTION:

SYNTHETIC DESORPTION

Row specified item interacts with  $\text{g}_{\text{H}}$  with specified item: interaction specified by column

Column specified item is threat enemy item, interaction occurs by mechanism specified in directory.

Column specified item is friendly U.S. item, interaction occurs by mechanism specified in directory.

Figure 3-2 Key to AMODS Command/Control Item/Interaction Tables

ROWS: Specified friendly (U.S.) command/control item.

**COLUMNS:** Specified friendly (U.S.) item with which ROW item interacts, ordered as follows:

Columns 1, 4, 7, 10, 13: Commanders

Columns 2, 5, 8, 11, 14: Staff

Columns 3, 6, 9, 12, 15: Forces

**INTERACTION:** Specified by columns, ordered as follows:

### Columns 1-3 : Organize

Columns 1-3 : Organize  
Columns 4-6 : Allocate

Columns 4-6 : Allocat  
Columns 7-9 : Direct

Columns 7-9 : Direct  
Columns 10-12: Inverse

## SYMBOL

## DESCRIPTION

\* Indicates that an interaction occurs by mechanism specified in directory.

interact only with other friendly command/control items; therefore the item/interaction cells are not divided in the command/control tables. Again, an asterisk in the C2 item/interaction cell indicates that the specified interaction should be addressed. Further resolution of row and columns follows the resolution format of the battle item/interaction tables. Figure 3-2 illustrates how to read Tables 2 through 2.3.3; the asterisk in cell (1, 3) indicates that the "commanders/organize/forces" interactions should be addressed. The asterisk in cell (2, 10) references discussion of "staff/inform/commanders" interactions.

As mentioned, the AMODS technique accomplishes resolution of row items with a hierarchy of tables. Level 1 of the hierarchy contains two tables (1 and 2) and provides an overview of the data cataloged. The rows of the Level 1 tables define groups of battle and command/control items. Further resolution of these item groups is given in the rows of the Level 2 tables. Level 2 of the hierarchy contains eight tables (1.1 through 1.5 and 2.1 through 2.3). These tables contain generic items determined by the Automated CORDIVEM user requirements as vital for accurate computer combat simulation. Level 3 rows, grouped by the generic items of Level 2, display the items indicated. The Level 3 rows show the item resolution of the given data base developed for the MOE, MOP, and data items. For detailed examples of the systematic structure of this scheme, the reader should examine the tables. In addition, Figure 3-3 outlines the nature of the AMODS methodology. A hierarchical numbering system shows the relationship between tables; battle item/interactions tables have the first digit 1, command/control tables have the first digit 2.

The directories, one corresponding to each table, have the same hierarchical structure and numbering system as the tables. For each filled item/interaction cell of a table, the accompanying directory catalogs the mechanisms, factors, and representations for that cell, indexed by row number and column number. Whereas the table hierarchy resolves row items for any given interaction, the directories resolve the column specified item involved in the interaction. In a sample directory for the command/control

Figure 3-3 AMODS Table Hierarchy Examples from Table 1,  
Table 1.1, and Table 1.1.1

<u>LEVEL 1 BATTLE ITEM/ INTERACTION OVERVIEW</u>	<u>LEVEL 2 WEAPONS SYSTEM AUTO CORDIVEM REQUIRED ITEMS</u>	<u>LEVEL 3 WEAPONS</u>
<ul style="list-style-type: none"> <li>o Weapon System           <ul style="list-style-type: none"> <li>1 Weapons</li> <li>2 Personnel</li> <li>3 Communications</li> <li>4 Additional Equipment</li> </ul> </li> <li>o Command System           <ul style="list-style-type: none"> <li>.</li> <li>.</li> <li>.</li> </ul> </li> <li>o Support System           <ul style="list-style-type: none"> <li>.</li> <li>.</li> <li>.</li> </ul> </li> <li>o Sensor System           <ul style="list-style-type: none"> <li>.</li> <li>.</li> <li>.</li> </ul> </li> <li>o Environment           <ul style="list-style-type: none"> <li>.</li> <li>.</li> <li>.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>o Weapons           <ul style="list-style-type: none"> <li>1 Air/Ground Unguided</li> <li>2 Air/Ground Wire Guided</li> <li>3 Air/Ground Electro/Optical</li> <li>4 Ground/Ground Direct Fire</li> <li>5 Ground/Ground Indirect Fire</li> <li>.</li> <li>.</li> </ul> </li> <li>o Personnel           <ul style="list-style-type: none"> <li>.</li> <li>.</li> <li>.</li> </ul> </li> <li>o Communications           <ul style="list-style-type: none"> <li>.</li> <li>.</li> <li>.</li> </ul> </li> <li>o Additional Equipment           <ul style="list-style-type: none"> <li>.</li> <li>.</li> <li>.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>o Air/Ground Unguided           <ul style="list-style-type: none"> <li>1 Atk Hel Anti-Personnel</li> </ul> </li> <li>o Air/Ground Wire Guided           <ul style="list-style-type: none"> <li>.</li> <li>.</li> </ul> </li> <li>o Ground/Ground Indirect Fire           <ul style="list-style-type: none"> <li>7 Howitzer, 155mm and 8"</li> <li>8 Rocket and MLRS</li> <li>9 Mortar Launcher</li> <li>10 Missile Launcher</li> <li>.</li> <li>.</li> <li>.</li> </ul> </li> </ul>

table of Figure 3-2, Figure 3-4 presents the format and general content of the AMODS directories.

These tables and directories facilitate the process of reviewing the combat system requirements by providing a simple, concise format for data presentation. The tables and directories provide the basis for discussing the completeness of the representation with respect to Automated CORDIVEM scope and resolution requirements.

### 3.5

### BATTLE INTERACTIONS, MECHANISMS, AND FACTORS DEFINITIONS

Battle interactions are defined as follows:

1. Damage: to destroy, reduce, or degrade the capability, effectiveness, or utility of personnel, weapons, equipment, or environment.
2. Suppress: to temporarily disrupt or disable personnel, weapons, equipment, or effective military operations by means of direct or indirect fires, electronic interference, smoke, or other environmental conditions.
3. Detect: to recognize hostile personnel, weapons, equipment or conditions.
4. Delay: to stop, detain, or hinder for a period of time.
5. Deceive: to mislead the enemy by manipulation, distortion, or falsification of electronic, tactical, or operational evidence.

Figure 3-4 Sample Directory

Directory Sample AMODS Command/Control Table

(ITEM, INTERACTION)	DESCRIPTIONS	Key Level
(1, 3)	<p><u>Column Item:</u> Mechanized Infantry</p> <p><u>Mechanisms:</u> Perceive (current combat situation), Compare/Decide (operation concept), Select (consider advantages)</p> <p><u>Factors:</u> Size (of troops), Type (of troops), Status, Posture</p> <p><u>Representations:</u> The commander requires timely and accurate combat intelligence from his staff.</p>	
(2, 10)	<p><u>Column Item:</u> Division Commander</p> <p><u>Mechanisms:</u> Query (obtain information), Fuse (combine data into usable information)</p> <p><u>Factors:</u> Mission, Time and Space, Weather</p> <p><u>Representations:</u> Communication is primarily oral.</p>	

6. Support: to aid, make secure, move, complement, maintain, or provision combat forces.
7. Communicate: to provide operational data, information concerning friendly or enemy forces, commands, or requests.

Battle mechanisms are defined below. The numbering of the mechanisms given below is used in the tables and directories.

1. Engage: to bring direct fire, indirect fire, special ordnance, or air and air defense fires to bear on the enemy.
2. Move/Position: to displace from and/or locate at a physical position on the battlefield.
3. Transmit/Receive: to generate, emit, acquire, or intercept signals from friendly or enemy sources.
4. Inactivate: to render inoperative due to intrinsic limitations.
5. Expend: to deplete or exhaust a resource.
6. Sense: to search for and acquire visual, aural, electromagnetic, or chemical signals from friendly or enemy forces.
7. Jam: to prevent the reception of electronic signals by electronic means.
8. Sustain: to repair, replace, rearm, refuel, reconstitute, or decontaminate friendly forces.

9. Obscure: to inhibit sensing by the attenuation of visible light or by interference with other forms of electromagnetic radiation.
10. Conceal: to protect from enemy observation.
11. Impede: to hinder or interfere with movement by means of a natural or man-made barrier.
12. Cover: to protect from enemy fire.
13. Activate: to provide the means, power, or capability to perform a task.

Battle factors are defined below. The numbering given below for the factors is used in the tables and directories.

1. Lethality: the accuracy, rate of fire, destructive radius of munitions, range of projectile or emissions, acquisition rate, engagement rate or wattage of a weapon system.
2. Susceptability: the visual, aural, or electronic signature of an item; or the hardness or thickness of cover or armor for an item.
3. Maneuverability: the speed, manageability, or range of a vehicle.
4. Sensitivity: the rate of detection or scan, or the size of the search area, or detection capability of a sensor.

5. Availability: the basic load, reliability, maintainability or fitness of a system.

### 3.6

#### COMMAND AND CONTROL INTERACTIONS, MECHANISMS, AND FACTORS DEFINITIONS

1. Organize: to cause to develop an organic structure; to arrange or form into a coherent unity or functioning whole; or to set up an administrative structure for either command and control staff or for military forces.
2. Direct: to request or enjoin with authority; to dominate and determine the course of staff or military elements.
3. Allocate: to apportion military resources for a specific command and control or combat operation.
4. Inform: to give information or knowledge or to communicate knowledge to command and control or force elements.
5. Request: to seek or ask for intelligence or operations data or information, or to seek or ask for support.

Command and Control mechanisms are defined below. Precise definitions of the component elements of this category are currently being developed by the Army. The following list of mechanisms has been established as a complete set; tentative definitions are provided. The numbering of the mechanisms is used in the tables and directories.

1. **Fuse:** to combine data related to either/or both enemy and friendly forces into a usable set of data or information for incorporation into situation description.
2. **Perceive:** to incorporate available data and information into a current combat situation description.
3. **Compare/Decide:** to compare the current or potential/anticipated situation with the desired or planned situation; and to determine a new set of actions to develop or obtain an improvement or adjustment to the subject situation.
4. **Select:** to determine and assess the advantages and disadvantages of alternative courses of action.
5. **Plan/Order:** to develop operations plans, warning orders, fragmentary orders, and directives.
6. **Disseminate:** to prepare and initiate the transmission of messages, reports, plans, and orders.
7. **Coordinate:** to ensure that a full understanding exists among all concerned military personnel and units.
8. **Initiate:** to assign responsibility for, or direct staff or subordinate elements to begin specific actions.

9. Query: to identify and seek or ask for operations or intelligence data and information.
10. Supervise: to analyze reports and messages concerning subordinate elements and their progress in accomplishing their mission.

Command and Control factors are defined below. The numbering given below for the factors is used in the tables and directories.

1. Size: number of enemy and friendly force components.
2. Type: component elements of friendly and enemy forces.
3. Location: the battlefield coordinates of enemy and friendly forces.
4. Identify: the key characteristics of enemy and friendly elements.
5. Time and Space: estimation of friendly and enemy component movement.
6. Activity: identification of unit actions, for example engagements, movements, emissions, etc.
7. Order of Battle: intelligence pertaining to identification, strength, command structure, and disposition of personnel, units, and equipment of any enemy force.
8. Intent: estimation of enemy unit plans.

9. Status: assessment of friendly and enemy unit personnel, equipment, supplies, and morale.
10. Posture: assessment of friendly and enemy force deployments with respect to cover, concealment, and fortifications.
11. Terrain: identification of key terrain features, avenues of approach, observation, and fires.
12. Weather: identification of essential aspects of weather as it relates to operations.
13. Mission: identification of tasks, objectives, time constraints, sequencing of tasks and operations.
14. Product: any staff generated estimate, plan, order, Standard Operating Procedures (SOP), or document which supports operations.
15. Responsibility: accountability assigned by higher authority to specific staff officers or staff elements.

3.7

TABLE 1, BATTLE ITEM-INTERACTION (LEVEL 1)

The item-interactions indicated in Tables 1 and 1.1-1.5 present the key combat elements which should be represented in an Automated CORDIVEM model. Table 1 (Level 1) provides an overview of the interactions considered. Further details concerning mechanisms, factors and representations are given in Tables 1.1-1.5 (Level 2) and the accompanying directories. Items and entries in Tables 1 and 1.1-1.5 have been selected to reflect Army doctrine, present day technologies and the user requirements

presented in this document. Several of the specific issues considered in the development of the table structures are outlined below:

- o Weapon systems, physical characteristics of the command system, support systems and sensor systems (intelligence acquisition) are separated into distinct items to facilitate trade-off studies between development in these different systems (this document, p. 2-2).
- o Personnel using or operating weapons, sensor or communications equipment are located in different item classes. This distinction allows for effectiveness studies between new command and control procedures (tactics, etc.) and the acquisition of new equipment (this document, p. 2-4, #6).
- o Weapons, sensors, and communication equipment are classified according to technological characteristics (that is, projectile guidance mechanisms, type of emission sensed, etc.) to permit straightforward classification/incorporation of new weapon, sensor, or communication systems (this document, p. 2-33, #b).
- o Separate classification of environmental effects allows for representation of virtually any conceivable environment, natural or man-made (this document, p. 2-33, #d).
- o At level 2, weapon system personnel are represented to the company level to provide sufficient model resolution (this document, p. 2-35).

- o Items considered particularly susceptible to enemy attack (command posts, depots, communication relays) are distinctly classified.

several assumptions have been made in the process of establishing the table entries. These assumptions are listed below:

- o Maneuver, fire support (artillery) and air defense weapons are all included in the weapon system.
- o Electronic warfare assets are considered as part of the non-lethal weapons system.
- o Intelligence functions are included in the sensor system.
- o Lethal weapons are used to damage, suppress, or delay.
- o Computers "communicate" with personnel.
- o Depots "locate/position" of their respective supplies.
- o Support personnel are classified by function, not echelon.
- o Roads, railroads, and cities are part of the environment.

TABLE I BATTLE ITEM-INTERACTION

ITEM	INTERACTION					DETECT										DECEIVE					SUPPORT					COMMUNICATE																	
	DAMAGE	SUPPRESS	DETACH	DELAY	DECEIVE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35			
WEAPON SYSTEM																																											
1 WEAPONS	*	*	*	*	*																																						
2 PERSONNEL	*	*	*	*	*																																						
3 COMMUNICATIONS																																											
4 ADD EQUIP					*																																						
COMMAND SYSTEM																																											
5 COMMANDERS																																											
6 MAIN CP																																											
7 TAC CP																																											
8 REAR CP																																											
9 COMMUN SUPPORT																																											
10 COMMUN EQUIP																																											
SUPPORT SYSTEM																																											
11 SUPPLIES																																											
12 PERSONNEL																																											
13 ADD EQUIP																																											
14 COMMUNICATIONS																																											
15 REPORTS																																											
SENSOR SYSTEM																																											
16 SENSORS																																											
17 PERSONNEL																																											
18 SENSOR CENTERS																																											
19 ADD EQUIP																																											
20 COMMUNICATIONS																																											
ENVIRONMENT																																											
21 IR CAPTURE																																											
22 ATMO. THRM																																											
23 INTELLIGABILITY																																											
24 BATTLE INITIATIVES																																											

STAFF  
SUPPORT  
COMBAT  
TECHNICAL

AD-A148 483

DEFENSE INFORMATION SYSTEMS PROGRAM AUTOMATED CORDIVEM  
DESIGN REQUIREMENTS(U) JET PROPULSION LAB PASADENA CA  
C TODD ET AL. 28 FEB 84 JPL-D-905 NASA-7860-0351

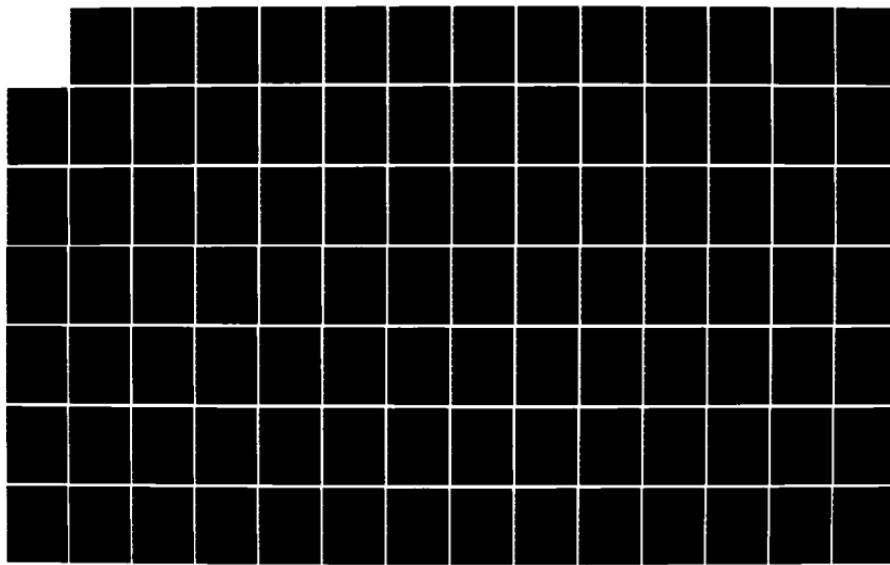
2/7

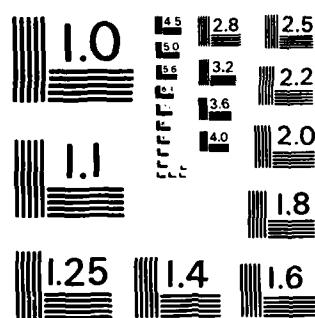
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS - 1963 - A

**TABLE 1.1 WEAPONS SYSTEM**

ITEM	INTERACTION				DAMAGE				SUPPRESS				DETECT				DELAY				DECIEVE				SUPPORT				COMMUNICATE				LEVEL :	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
<b>WEAPONS</b>																																		
1	A-G UNGUIDED	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2	A-G WIRE GUIDED	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	A-G LASER GUIDED	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
4	A-G ELECTRO/OPT	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
5	G-G DIRECT FIRE	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
6	G-G INDIRECT FIRE	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
7	G-A RADAR GUIDED	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
8	G-A IR GUIDED	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
9	G-A UNGUIDED	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10	A-A	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11	REMOTE DETONATION	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12	NUCLEAR/CHEMICAL	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13	NONLETHAL	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>PERSONNEL</b>																																		
14	CORPS	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15	DIVISION	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16	BRIGADE	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	BATTALION	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18	COMPANY	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>COMMUNICATIONS</b>																																		
19	SUPPORT CENTERS	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20	EQUIPMENT	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>ADDITIONAL EQUIP</b>																																		
21	VEHICLES	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22	COMPUTERS	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23	METEOROLOGICAL EQP	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>ENV SENSOR SUPPORT COMMAND WEAPON</b>																																		

Directory 1.1 Battle Item-Interactions (Weapon System)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(1, 1)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Specify weapon and warhead	
(1, 2)	Same as (1, 1)	
(1, 3)	<u>Item:</u> Personnel vehicles, weapons <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Specify weapon and warhead	
(1, 4)	<u>Item:</u> Personnel, vehicles, sensors <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Specify weapon and warhead	
(1, 5)	<u>Item:</u> Roads, bridges, railroads <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Specify weapon and warhead	
(1, 6)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> (Same as (1, 1)) <u>Factors:</u> <u>Representations:</u> Shooting causes target obscuration. Specify weapon and warhead.	
(1, 7)	Same as (1, 2)	
(1, 8)	Same as (1, 3)	
(1, 9)	Same as (1, 4)	
(1, 16)	Same as (1, 6)	
(2, 1)	<u>Item:</u> Armor, hard targets <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Warheads are fired from helicopters	
(2, 6)	Same as (2, 1)	
(2, 16)	Same as (2, 1)	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(3, 1)	<u>Item:</u> Armor, hard targets <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Currently experimental weapons that are helicopter launched (COPPERHEAD, HELLFIRE)	
(3, 6)	Same as (3, 1)	
(3, 16)	Same as (3, 1)	
(4, 1)	<u>Item:</u> Armor, hard targets <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Air Force weapon systems used for air interdiction (MAVERICK).	
(5, 1)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Used against line of sight targets. Specify weapon and warhead.	
(5, 5)	<u>Item:</u> Roads, bridges <u>Mechanism:</u> 2 <u>Factors:</u> 3 <u>Representations:</u> Damage interferes with resupply	
(5, 6)	Same as (5, 1)	
(5, 16)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Used against line of sight targets. Specify weapon and warhead.	
(5, 26)	<u>Item:</u> Infantry <u>Mechanism:</u> 2 <u>Factors:</u> 3 <u>Representations:</u> Includes vehicles such as APCs and IFVs.	
(6, 2)	Same as (1, 2)	
(6, 3)	Same as (1, 3)	
(6, 4)	Same as (1, 4)	
(6, 6)	Same as (6, 6)	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(6, 7)	Same as (1, 7)	
(6, 8)	Same as (1, 8)	
(6, 9)	Same as (1, 9)	
(6, 16)	Same as (1, 16)	
(6, 17)	Same as (1, 17)	
(6, 18)	Same as (1, 18)	
(6, 19)	Same as (1, 19)	
(7, 1)	<u>Item:</u> Fixed and rotary wing aircraft <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Usually used with air warning system. Has a longer range than IR guided.	
(7, 6)	Same as (7, 1)	
(7, 16)	Same as (7, 1)	
(8, 1)	<u>Item:</u> Fixed and rotary wing aircraft <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Heat seeking (STINGER, CHAPARRAL)	
(8, 6)	Same as (8, 1)	
(8, 16)	Same as (8, 1)	
(9, 1)	<u>Item:</u> Fixed and rotary wing aircraft <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> VULCAN/DIVAD GUN	
(9, 6)	Same as (9, 1)	
(9, 16)	Same as (9, 1)	
(10, 1)	<u>Item:</u> Primarily helicopters <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> IR guided	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(10, 6)	Same as (10, 1)	
(11, 16)	<u>Item:</u> Tanks, vehicles, personnel <u>Mechanism:</u> 11 <u>Factors:</u> 1,4 <u>Representations:</u> Abatis, booby-traps, mines	
(12, 1)	<u>Item:</u> Nuclear: tank concentrations rear area; chemical: personnel <u>Mechanism:</u> 1 <u>Factors:</u> 1,4 <u>Representations:</u> Nuclear fires must be authorized at the highest level. TRADOC Pam 525-5 states, "Nuclear weapons are used by defining forces to disrupt and destroy follow-on echelons to create the time and space for maneuver against assaulting echelons. Attacking forces use nuclear weapons against defending enemy first-echelon divisions to create and extend gaps through which they can maneuver into enemy rear areas. Delivery systems accompany the attacking force. Nuclear weapons are also used to destroy enemy divisional reserves before they can influence the battle."  Nerve gas is highly lethal and its use must also be authorized at the highest level. Mustard and choking or blood gas, which may be protected against with nerve gas, require special authorization. Again, from TRADOC Pam 525-5:  "Chemical weapons are used againsts enemy command and control centers, logistical support activities, etc. They are used to deny rapid movement of enemy forces through a designated area. Chemical weapons can be employed in selected areas to canalize attacking enemy or where nuclear weapons can be used.  Chemical weapons can be used by attacking forces to deny selected areas to the enemy; for example, checkpoints along avenues of approach for enemy divisional counterattack forces and favorable locations for artillery positions."	
(12, 2)	<u>Item:</u> Command posts, communications centers <u>Mechanism:</u> 1 <u>Factors:</u> 1,4 <u>Representations:</u> Same representation as (12, 1)	
(12, 3)	<u>Item:</u> Depots <u>Mechanism:</u> 1 <u>Factors:</u> 1,4 <u>Representations:</u> Same representation as (12, 1)	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(12, 6)	Same as (12, 1)	
(12, 7)	Same as (12, 2)	
(12, 8)	Same as (12, 3)	
(12, 16)	<u>Item:</u> Tank concentrations, personnel <u>Mechanism:</u> 1 <u>Factors:</u> 1,4 <u>Representations:</u> Same representation as (12, 1); movement of friendly units into contaminated areas may be delayed.	
(12, 17)	Same as (12, 2)	
(12, 18)	Same as (12, 3)	
(13, 6)	<u>Item:</u> Personnel, vehicles <u>Mechanism:</u> 9,1 <u>Factors:</u> 1 <u>Representations:</u> Smoke; tear and vomiting gas	
(13, 7)	<u>Item:</u> Communication equipment <u>Mechanism:</u> 7 <u>Factors:</u> 4 <u>Representations:</u> Jammers (transmitters, reflectors); activities include electronic warfare (that division of the military use of electronics involving actions taken to prevent or reduce an enemy's effective use of radiated electromagnetic energy, and actions taken to ensure effective use of radiated electromagnetic energy) and electronic warfare support measures (that division of EW involving actions taken to search for intercept, locate, record and analyze radiated electromagnetic energy, for the purpose of exploiting such radiations in support of military operations. ESM provides a source of EW information required to conduct electronic countermeasures (ECM), electronic counter-countermeasures (ECCM), threat detection, warning, avoidance, target acquisition and homing).	
(13, 9)	<u>Item:</u> Sensors <u>Mechanism:</u> 7 <u>Factors:</u> 4 <u>Representations:</u> Jammers, decoys	
(13, 16)	<u>Item:</u> Personnel, vehicles <u>Mechanism:</u> 1,9 <u>Factors:</u> 9,1	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<u>Representations:</u> Smoke, tear and vomiting gas; friendly units movement into contaminated area may be delayed.	
(13, 17)	<u>Item:</u> Communications equipment <u>Mechanism:</u> 7 <u>Factors:</u> 4 <u>Representations:</u> Communications may be delayed by jamming.	
(13, 21)	<u>Item:</u> Personnel <u>Mechanism:</u> 9,10 <u>Factors:</u> 2 <u>Representations:</u> Deceptive smoke screen  <u>Item:</u> Sensors <u>Mechanism:</u> 7 <u>Factors:</u> 4 <u>Representations:</u> Radiation, re-radiating, alteration or reflection of electromagnetic energy may be used to mislead the enemy in the interpretation or use of information received by a radar. FM 44-90 explains,  "Transmitted deception signals are produced by special radiofrequency transmitters which cause false or inaccurate echoes on the radar and confuse the operator. The signals from the deception transmitter can range from a single target of inaccurate position to targets representing a large formation of planes or targets scattered all over the indicator to make it difficult to discern the true target. Two types of transmitted deception are acquisition false targets (spoofers) and track breakers.  Reflected deception is produced by objects capable of reflecting electromagnetic energy so the return echoes will present false or inaccurate information to the radar operator. These objects will create false targets, conceal the action of true targets, and cause errors in radar operation and measurement. This may cause the true target signal to slip by undetected or unidentified when the radar is bombarded by a multitude of misleading signals from the vicinity of the target. The most commonly used reflectors are chaff, rope, corner reflectors, and decoys."	
(14, 1)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> As enumerated in the FAROs, corps personnel include the following:	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, <u>INTERACTION</u> )	<u>DESCRIPTION</u>	LEVEL 2
	Armored Cavalry Squadron (ACR) Air Cavalry Troop (ACT) Attack Helicopter Battalion(s) Separate Brigade(s) Corps Level Jammers General Support Battery Aircraft Sorties Battlefield Air Interdiction - Mission Package Ships (General or Direct Support) GS HIMAD Battery SHORAD Battery	
	<p>These personnel have access primarily to surface-to-surface missiles (LANCE): 155 mm, 175 mm and 203 mm howitzers; AHs; VULCAN/DIVAD Gun/Chaparral missiles (HAWK missiles assigned by EAC). TRADOC Pam 525-5 states, "The corps plans and allocates resources for operations generally found within about 150 kilometers of the forward line of own troops. Corps generally conducts offensive operations by massing fires or forces against enemy flanks, gaps, or rear; by seeking to avoid enemy strength; by going against enemy weak areas; and by using economy of force in areas from which forces have been drawn in order to mass."</p>	
(14, 2)	<u>Item:</u> Personnel, vehicles <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Units with access to indirect fire weapons damage command systems.	
(14, 3)	<u>Item:</u> Personnel, vehicles, depots <u>Mechanism:</u> <u>Factors:</u> Same as (14, 2) <u>Representations:</u> Same as (14, 2)	
(14, 4)	<u>Item:</u> Personnel, vehicles, sensors <u>Mechanism:</u> <u>Factors:</u> Same as (14, 2) <u>Representations:</u> Same as (14, 2)	
(14, 6)	Same as (14, 1)	
(14, 7)	Same as (14, 2)	
(14, 8)	Same as (14, 3)	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(14, 9)	Same as (14, 4)	
(14, 11)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> 6 <u>Factors:</u> 2 <u>Representations:</u> Aerial observers, forward observers with arty units. (Note: These may also be considered as part of the sensor system.)	
(14, 21)	<u>Item:</u> Personnel <u>Mechanism:</u> 2,10 <u>Factors:</u> 2,3 <u>Representations:</u> Feints, displays, ruses	
(14, 31)	<u>Item:</u> Personnel <u>Mechanism:</u> 3 <u>Factors:</u> 4 <u>Representations:</u> Radios (single channel FM, line of sight, sky wave, ground wave), wire, cable, messengers	
(14, 32)	<u>Item:</u> Corps commander, Staff <u>Mechanism:</u> 3 <u>Factors:</u> 4 <u>Representations:</u> Same as (14, 31)	
(15, 1)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> (Same as (14, 1)) <u>Factors:</u> <u>Representations:</u> As enumerated in the FAROs, division personnel include the following:  Divisional Attack Helicopter Battalion(s) Divisional Cavalry Squadrons Division Level Jammers (CEWI BN) General Support Battery Air Sorties Ships (General or Direct Support) GSR HIMAD Battery SHORAD Battery	
	The primary assets of these personnel include arty (105 mm, 155 mm and 203 mm howitzers, MRLS); AHs; VULCAN/DIVAD GUN/CHAPARRAL missiles. The scope of division activities is described in FM 71-100: "A division may be armored, mechanized, infantry, airborne, or air assault. It is a self-sustaining force capable of independent operations, even for long period of time, when properly reinforced. A division	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	usually fights as part of a larger force, most often a corps. Divisions, however are the backbone of the Army and the land battle is won or lost by their battalions."	
(15, 2)	Same as (14, 2)	
(15, 3)	Same as as (14, 3)	
(15, 4)	Same as (14, 4)	
(15, 6)	Same as (15, 1)	
(15, 7)	Same as (15, 2)	
(15, 8)	Same as (15, 3)	
(15, 9)	Same as (15, 4)	
(15, 11)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> (Same as (14, 11)) <u>Factors:</u> <u>Representations:</u> Same as (14, 11), range of detection is less than for corps.	
(15, 16)	Same as (15, 1)	
(15, 17)	Same as (15, 2)	
(15, 18)	Same as (15, 3)	
(15, 19)	Same as (15, 4)	
(15, 21)	Same as (14, 21)	
(15, 31)	Same as (14, 31), range shortened	
(15, 32)	Same as (14, 32), range shortened	
(16, 1)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> As enumerated in the FAROs, brigade personnel, most often assigned to lower level battalions, include:	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"> <li>Maneuver Battalions           <ul style="list-style-type: none"> <li>o Infantry</li> <li>o Mechanized Infantry</li> <li>o Tank</li> <li>o Air Assault Infantry</li> <li>o Airborne Infantry</li> <li>o Attack Helicopter</li> </ul> </li>   <li>Direct Support Battery           <ul style="list-style-type: none"> <li>DIVAD Gun/STINGER Battery</li> </ul> </li> </ul>	
	<p>These personnel use primarily direct fire weapons; REDEYE/STINGER missiles and arty support assigned by division command units. The brigade is a combination of tank and mechanized infantry task forces and other units grouped under command of a brigade headquarters.</p>	
(16, 6)	Same as (16, 1)	
(16, 11)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> 6 <u>Factors:</u> 2 <u>Representations:</u> Visual detection	
(16, 16)	Same as (16, 1)	
(16, 21)	Same as (14, 21)	
(16, 31)	<u>Item:</u> Personnel <u>Mechanism:</u> (Same as (14, 31)) <u>Factors:</u> <u>Representations:</u> Same representation as (14, 31), shorter range	
(16, 32)	Same as (16, 31)	
(17, 1)	<u>Item:</u> Personnel, vehicles, weapons <u>Mechanism:</u> 1 <u>Factors:</u> 1,3,4 <u>Representations:</u> Include mission-oriented battalion task forces. FM 71-2 explains, "The battalion task force is a combination of tank and mechanized infantry companies and other units grouped under command of the headquarters of a tank or mechanized infantry battalion. Frequently, attack helicopter units may operate with the battalion task force, which will normally be supported by field and air defense artillery. Sometimes it's supported by USAF tactical fighter	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	bombers. A wide range of engineer, signal, and logistics support is available and may, from time to time, be part of the battalion task force. The battalion task force is then a combined arms team . . .	
	The tank with its cross-country mobility, its armor protection, and its formidable firepower, has been and is likely to remain the most important weapon in the battalion task force. The accuracy of tank guns gives them a high probability of a first round hit and the lethality is such that if the target is hit it will be killed . . .	
	Mechanized infantry plays an important role in the operations of combined arms forces on the modern battlefield. The infantry's mobility is sufficient to enable it to maintain the pace of highly mobile armored warfare and it is equipped with a broad spectrum of weapons ranging from highly sophisticated ATGM (Antitank Guided Missiles) to rifles . . .	
	Modern ATGM have very high hit and kill probabilities against point targets at long ranges . . .	
	In the near future, the task force will have an indirect fire tank killing capability in the cannon launched guided projectile (CLGP), and also the ability to effectively emplace mine fields with artillery munitions as the tactical situation develops. To gain additional time, the task force should use mines to canalize and slow the enemy, thereby multiplying the effectiveness of the tank and ATGM fires. In the past, the laying of minefields required great expenditures of manpower and time."	
(17, 6)	Same as (17, 1)	
(17, 11)	Same as (16, 11)	
(17, 31)	Same as (16, 31)	
(17, 32)	Same as (16, 32)	
(18, 1)	<p><u>Item:</u> Personnel, vehicles, weapons  <u>Mechanism:</u> 1  <u>Factors:</u> 1,3,4  <u>Representations:</u> Primary weapons are 80 mm mortars, machine guns, grenade launchers, anti-tank missile launchers, rifles, pistols, tank guns, REDEYE/STINGER missiles</p>	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(19, 32)	<p><u>Item:</u> Commanders, staff  <u>Mechanism:</u> 3  <u>Factors:</u> 4  <u>Representations:</u> Bde FASC, Divarty TOC signal center, main CP signal centers</p>	
(20, 31)	<p><u>Item:</u> Personnel  <u>Mechanism:</u> 3  <u>Factors:</u> 4  <u>Representations:</u> Primarily radios and wire or cable are used. FM 71-2 describes, "The enemy has a significant electronic warfare capability. He can block out radio transmissions during critical periods in the fight. He can listen to transmissions to gain information. He can give false instructions through imitative transmissions. The commander must be able to command and control the battalion task force throughout the battle, in spite of enemy efforts to disrupt the system. To do this, the force must effectively counter enemy electronic warfare efforts against command and control systems by:</p> <ul style="list-style-type: none"> <li>o Planning for control through alternate means in case the primary means is suppressed messengers, personal contact, prearranged signals and visual means should be used whenever possible.</li> <li>o Using radio only when necessary and then transmitting as quickly as possible.</li> </ul>	
(20, 31)	<p>Some confusion in battle is certain to occur. However, if the commander has positive control and issues clear, concise orders, confusion and misunderstanding will be minimized.</p>	
(21, 26)	<p><u>Item:</u> Personnel  <u>Mechanism:</u> 2  <u>Factors:</u> 3  <u>Representations:</u> Include jeeps, trucks</p>	
(22, 26)	<p><u>Item:</u> Arty personnel  <u>Mechanism:</u> 3  <u>Factors:</u> 4  <u>Representations:</u> TACFIRE (computes trajectories), man transportable terminal linked to computers at fire direction centers.</p>	

Directory 1.1 Battle Item-Interactions (Weapon System) (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(23, 15)	<p><u>Item:</u> Winds, temperature <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Balloons, radars used by arty personnel</p>	

TABLE 1.2 COMMAND SYSTEM

ITEM	INTERACTION					LEVEL 1					LEVEL 2																								
	DAMAGE					SUPPRESS					DETECT					DECIEVE																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
<b>COMMANDERS</b>																																			
1 CORPS																																			
2 DIVISION																																			
3 BDE/GR/REG																																			
4 BN/SQDN																																			
<b>MAIN CP</b>																																			
5 VEHICLES																																			
6 STAFF/COMPUTERS																																			
7 SIGNATURE/LOCATION																																			
<b>TAC CP</b>																																			
8 VEHICLES																																			
9 STAFF/COMPUTERS																																			
10 SIGNATURE/LOCATION																																			
<b>REAR CP</b>																																			
11 VEHICLES																																			
12 STAFF/COMPUTERS																																			
13 SIGNATURE/LOC																																			
<b>COMMUNICATION SP</b>																																			
14 SIGNAL CENTERS																																			
15 RELAY STATIONS																																			
16 ATC STATIONS																																			
<b>COMMUNICATION EQUIP.</b>																																			
17 TRUNKS/SWITCH BR																																			
18 RADIO																																			
19 WIRE/CABLE																																			
20 TELETYPE																																			
21 SATELLITE																																			
22 MESSENGERS																																			
23 VISUAL SOUND																																			

ENVIRONMENT  
SENSOR  
SUPPORT  
COMMAND  
WEAPON

Directory 1.2 Command System

<u>(ITEM, (INTERACTION)</u>	<u>DESCRIPTION</u>	<u>LEVEL 2</u>
(1, 32)	<p><u>Item:</u> Commanders, corps staff  <u>Mechanism:</u> 3  <u>Factors:</u> 2,3</p> <p><u>Representations:</u> Corps commander representation should reflect the following observation made in TRADOC Pam 525-5: "The corps commander locates himself where he can best direct corps operations. This may be at a corps tactical command post or at the corps main command post. If a corps tactical command post is used, staff assistance-intelligence, operations, fire support necessary to make assessments, issue instructions, and follow the battle must also be located there.</p>	
(2, 32)	<p><u>Item:</u> Commanders, division staff  <u>Mechanism:</u> 3  <u>Factors:</u> 2,3</p> <p><u>Representations:</u> As stated in FM 71-100: "Depending on circumstances the division and brigade commanders leave their command posts and locate themselves at a vantage point well forward. The effect of the commander's presence at critical times and at locations may make the difference in battle and is carefully considered. It is at the "moment of truth" where great battle leaders can turn defeat to victory and a tactical window of opportunity into an operational advantage."</p>	
(3, 32)	<p><u>Item:</u> Commander; brigade, group or regiment staff  <u>Mechanism:</u> 3  <u>Factors:</u> 2,3</p> <p><u>Representations:</u> As stated in FM 71-100: "Depending on circumstances the division and brigade commanders leave their command posts and locate themselves at a vantage point well forward. The effect of the commander's presence at critical times and at locations may make the difference in battle and is carefully considered. It is at the "moment of truth" where great battle leaders can turn defeat to victory and a tactical window of opportunity into an operational advantage."</p>	
(4, 32)	<p><u>Item:</u> Commanders; battalion command group; fire support liaison  <u>Mechanism:</u> 3  <u>Factors:</u> 2,3</p> <p><u>Representations:</u> The following description of a battalion task force command group characterizes both commander and staff mobility. FM 71-2 states: "Because of the rapid tempo</p>	

Directory 1.2 Command System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>of operations on the modern battlefield, the battalion task force commander frequently operates with a mobile command group.</p> <p>The command group moves to where the task force commander can best control operations. In an attack, this is most often near a lead team. In defense, the command group is usually where the enemy's main effort is being made. The remainder of his staff operates from a task force tactical operations center (TOC) and with the task force trains.</p> <p>In a task force organized around a mechanized infantry battalion headquarters, the command group rides in armored personnel carriers (APC).</p> <p>In a task force organized around a tank battalion headquarters, the group rides in tanks from the battalion headquarters company tank section or in armored personnel carriers. A tank battalion headquarters section has an APC designated for the USAF tactical air control party. Other APCs which can be used by the command group are available in the combat support company. When the command group operates from APCs, the headquarters company tank section can be used to overwatch. The command group would then be similar to other small units moving about the battlefield.</p> <p>Squadron commanders operate in a similar manner."</p>	
(5, 27)	<p><u>Item:</u> Commanders, staff, communications equipment  <u>Mechanism:</u> 2  <u>Factors:</u> 3</p> <p><u>Representations:</u> Jeeps, trucks (usually 1-1/4, 1-1/2, 5 or 8 ton), M-57Bs, M-577s, M-202s, M-113s, M-88s, TOW launchers, fuel servicing trucks, ambulances. Numbers and types of vehicles depend on echelon.</p>	
(6, 31)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanism:</u> 3  <u>Factors:</u> 5</p> <p><u>Representations:</u> Communications with weapon systems personnel at higher echelons occurs primarily through the tactical command post and at lower echelons through the main command post. FM radios, in operation 24 hours a day, are the most common communications link with the forward area.</p>	

Directory 1.2 Command System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(6, 32)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanism:</u> 3  <u>Factors:</u> 5</p> <p><u>Representations:</u> Staff communicate with written reports and orally. As stated in TC 101-5, current trends are to minimize hard copy messages and reports: "Complex operations at command posts produce an irreducible minimum of files and records that must be maintained for current reference and historical purposes. Recordkeeping is reduced by minimizing formal written reports, eliminating unnecessary and duplicate files and records, removing unnecessary functions from the main command post, increased emphasis on oral reporting, and efficient journalkeeping."</p> <p>Use of electronic communication means is usually limited to information of immediate operational necessity. FM 71-100 outlines electronic communication means: "The main CP keeps abreast of the current tactical situation by monitoring the two FM secure nets when possible but basically relies on multichannel means for contact with the tactical CP. If both FM and multichannel are inadequate because of distance, the chief of staff initiates necessary displacement to establish minimum communication.</p> <p>The . . . multichannel communications system is the secure backbone of the . . . communications system and is installed and operated . . . at the tactical CP, the pre-positioned CE site, and the main CP. . . Secure multichannel voice communications pass highly perishable intelligence data from the main CP to the forward elements. Based on circuit priorities, the tactical CP establishes circuits through the main CP . . . Command posts may be relocated if line-of-sight requirements exceed the capability of the available relays. Multichannel provides general user, point-to-point, hard copy teletype, and other capabilities in its 12-channel capability."</p>	
(6, 33)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanism:</u> 3  <u>Factors:</u> 5</p> <p><u>Representations:</u> Occurs primarily in the rear area.</p>	

Directory 1.2 Command System (Continued)

<u>(ITEM, (INTERACTION)</u>	<u>LEVEL 2</u>
<u>DESCRIPTION</u>	
(6, 34)	<p><u>Item:</u> Sensors  <u>Mechanism:</u> 9,10  <u>Factors:</u> 2,5</p> <p><u>Representations:</u> Requires dedicated communications between command posts. Such communications are usually provided by a secure FM net.</p>
(7, 9)	<p><u>Item:</u> Sensors  <u>Mechanism:</u> 9,10  <u>Factors:</u> 2,5</p> <p><u>Representations:</u> As much as possible, command posts should have reduced electronic signatures. This may be achieved by:</p> <ul style="list-style-type: none"> <li>o Use of directional antennas</li> <li>o Prudent distribution of equipment</li> <li>o Three or more frequency/call-sign changes per day</li> <li>o Maximum use of remote radio operations</li> <li>o Innovative techniques such as changing radio operators concurrent with frequency changes.</li> <li>o Careful planning of CP and communication site locations, displacements, and use of terrain masking techniques</li> <li>o Message-shortening techniques</li> <li>o Stressing communication security, with particular emphasis on limiting traffic and on radio/telephone discipline</li> </ul>
(7, 27)	<p><u>Item:</u> Commanders, staff  <u>Mechanism:</u> 10  <u>Factors:</u> 2</p> <p><u>Representations:</u> Terrain masking, vegetation and man-made camouflage are used to cover and conceal command posts from the air. TRADOC Pam 525-5 discusses additional survivability options: "In addition to concealment through masking of the command post communications, survivability of the command post will be significantly enhanced by employing both duplication and dispersion. For this reason, the command post configuration that follows is a dispersed one. To provide a measure of survivability, the command posts will be organized functionally into cells - redundant cells and, as required, major cells which will be further broken down into subcells. A minimum distance of 500 meters must be maintained between cells to ensure survivability against current nonnuclear devices. There should be 5 to 8-km distance between redundant cells [e.g., main and tactical command posts].</p>

Directory 1.2 Command System (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>Added survivability can be achieved by making use of existing buildings that further aid in masking actual command post locations. The cellular command post concept provides the commander with a degree of flexibility not previously available. The commander may, at his discretion, mass the various cells into the more traditional command post configuration and establish a TAC CP based on the perceived degree of the threat and situation."</p> <p>At the corps and division level, main command posts are located outside the range of enemy medium artillery. At the brigade, the main command post is located out of range of enemy direct and mortar fire, often within range of enemy artillery.</p>	
(8, 27)	<p><u>Item:</u> Commanders, staff  <u>Mechanism:</u> 2  <u>Factors:</u> 3  <u>Representations:</u> Vehicles are usually armored</p>	
(9, 31)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanism:</u> 3  <u>Factors:</u> 5  <u>Representations:</u> Usually via secure FM nets, capable of operation 24 hours a day and available on two independent sets of equipment. Two sets are maintained to guarantee communication service even during displacement. For survivability, the two sets are usually not collocated. Enemy DF efforts require strict communications security measures. AM radios (nonsecure) are used when extensive distances develop between main and tactical CP.</p>	
(9, 32)	Same as (9, 31)	
(9, 33)	Same as (9, 31)	
(9, 34)	Same as (9, 31)	
(10, 24)	Same as (7, 24)	
(10, 27)	<p><u>Item:</u> Commanders, staff  <u>Mechanism:</u> 10  <u>Factors:</u> 2  <u>Representations:</u> See (7, 27). Tactical command posts move frequently. These posts are located within FM range of subordinate forward troops.</p>	

Directory 1.2 Command System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(11, 27)	Same as (5, 27)	
(12, 31)	Same as (6, 31)	
(12, 32)	<u>Item:</u> Commanders, staff, forces <u>Mechanism:</u> (Same as 6, 32) <u>Factors:</u> <u>Representations:</u> Same as (6, 32). Computers are in common use for assistance in resupply of items in constant demand (POL, ammunition, food, etc.).	
(12, 33)	<u>Item:</u> Commanders, staff, forces <u>Mechanism:</u> (Same as 6, 33) <u>Factors:</u> <u>Representations:</u> Information of a critical nature (status of fuel, weapons, crews, etc.) is reported on secure nets. Other information is provided through logistics nets over RATT equipment.	
(12, 34)	<u>Item:</u> Commanders, staff, forces <u>Mechanism:</u> (Same as 6, 34) <u>Factors:</u> <u>Representations:</u> Limited in extent	
(13, 24)	<u>Item:</u> Sensors <u>Mechanism:</u> (Same as 7, 24) <u>Factors:</u> <u>Representations:</u> See (7, 9). Threat doctrine currently emphasizes disruption of rear area activities, hence increasing the necessity of a reduced rear CP signature. TRADOC Pam 525-5 explains: "A major element of Soviet military doctrine is disruption of the opposing force's rear area operations that include, but are not limited to, command and control centers, communications networks, supply facilities, airfields, and reserve echelons. Such disruption may be carried out either in the rear area in what appear to be independent operations, or immediately behind the main battle area closely coordinated with the initiatives of maneuvering forces. Enemy forces employed in the rear area include airdropped or airlanded conventional units, special operations teams specifically trained for reconnaissance and sabotage, and activated sleeper-agent cells and networks."  Rear command posts are usually located about the same distance from the FLOT as the main command posts of the next higher echelon.	

Directory 1.2 Command System (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(14, 27)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanism:</u> 3  <u>Factors:</u> 5  <u>Representations:</u> FM 24-1 says, "The signal unit is responsible for installing, operating, and maintaining the facilities to provide communications to a command headquarters or units in a specific geographical area. A signal center is made up of a Telecommunications Center, Switchboard, a Communications Nodal Control Element, and External Communications Means . . ."</p> <p>All signal centers perform the same functions and, for the most part, render the same services. But, you will run into two categories of signal centers to support you during the fight. These are Command Signal Centers and Area Signal Centers.</p> <ul style="list-style-type: none"> <li>o Command Signal Center - As indicated by its name, the Command Signal Center is dedicated to providing communications to a specific command headquarters. It can provide communications to other units in the area, if enough facilities are available. In the division communications systems, command signal centers give the commander the backbone network for command and control of his subordinate headquarters.</li> <li>o Area Signal Center - An Area Signal Center serves a geographical area. It is tasked to provide units located within an area the facilities to supplement their organic C-E means. In the division communications system, area signal centers will be located in the forward division area, adjacent to the brigade transportation area. The command and area signal centers are interconnected and form the backbone of a communications system."</li> </ul>	
(14, 31)	Same as (14, 27)	
(14, 32)	Same as (14, 27)	
(14, 33)	Same as (14, 27)	
(14, 34)	Same as (14, 27)	

## Directory 1.2 Command System (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(15, 27)	<u>Item:</u> Commanders, staff, forces <u>Mechanism:</u> 3 <u>Factors:</u> 5 <u>Representations:</u> Primarily radio transmitters and receivers are used when communication over long distances is required.	
(15, 31)	Same as (15, 27)	
(15, 32)	Same as (15, 27)	
(15, 33)	Same as (15, 27)	
(15, 34)	Same as (15, 27)	
(16, 27)	<u>Item:</u> Staff, forces <u>Mechanism:</u> 3 <u>Factors:</u> 5 <u>Representations:</u> Easily transportable equipment set up near helicopter landing areas.	
(16, 31)	Same as (16, 27)	
(16, 32)	Same as (16, 27)	
(17, 27)	<u>Item:</u> Commanders, staff, forces <u>Mechanism:</u> 3 <u>Factors:</u> 5 <u>Representations:</u> Host nation telephone services	
(17, 31)	Same as (17, 27)	
(17, 32)	Same as (17, 27)	
(17, 33)	Same as (17, 27)	
(17, 34)	Same as (17, 27)	
(18, 22)	<u>Item:</u> Personnel, sensors <u>Mechanism:</u> 3 <u>Factors:</u> 4 <u>Representations:</u> This includes electronic deception, employed primarily by corps or division level personnel. RB 100-33 defines electronic deception, "electronic deception occurs when the enemy misinterprets what is received by his electronic systems. Electronic deception falls into two broad categories:	

Directory 1.2 Command System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"> <li>o Manipulative deception - deceives the enemy as he listens to friendly communications which intentionally provide incorrect or misleading information.</li> <li>o Imitative deception - deceives the enemy by entering his communications net while pretending to be one of his stations.</li> </ul> <p>Normally, electronic deception is part of a larger operation designed to accomplish a deception objective. It is seldom, if ever, conducted alone."</p>	
(18, 24)	Same as (18, 22)	
(18, 27)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanism:</u> 3  <u>Factors:</u> 5</p> <p><u>Representations:</u> FM 24-1 gives the following outline of radio uses in combat:</p> <p>"Main Features:</p> <ul style="list-style-type: none"> <li>o Wireless - can operate while mobile</li> <li>o Fast and can handle a large number of messages</li> <li>o Uses include - <ul style="list-style-type: none"> <li>Voice</li> <li>Radiotelegraph (CW)</li> <li>Radio Teletypewriter (RATT)</li> <li>Multichannel</li> </ul> </li> <li>o Types of modulation it uses are - <ul style="list-style-type: none"> <li>Amplitude Modulated (AM)</li> <li>Frequency Modulated (FM)</li> <li>Single Side Band AM (SSB)</li> </ul> </li> <li>o Primary frequencies used are - <ul style="list-style-type: none"> <li>High Frequency (HF)</li> <li>Very High Frequency (VHF)</li> <li>Ultrahigh Frequency (UHF)</li> <li>Super High Frequency (SHF)</li> <li>Extremely High Frequency (EHF)</li> </ul> </li> <li>o Transmission paths include - <ul style="list-style-type: none"> <li>Ground Wave</li> <li>Skywave</li> <li>Line of Sight</li> <li>Tropospheric Scatter</li> </ul> </li> </ul>	

Directory 1.2 Command System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
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Strong Points:

- o Can span great distances.
- o Remote Operations can be used.
- o Retransmission can be used to increase range and overcome obstacles.
- o Requires minimum manpower and minimum space for equipment.
- o Integrate with wire systems.
- o Can be secured.

Weak Points:

- o Unsecured radio is the least secure means of communications: It can be jammed or intercepted. Deceptions can be used.
- o Radio is subject to interference from the atmosphere, the terrain, and manmade sources.
- o Radio operation requires common frequencies, compatible equipment, and common range."

Multichannel radio links are widely used in combat operations, however these systems do require considerable time (up to 15 hours) to install. FM 24-1 says,

"Multichannel systems (or links) are used to provide communications or combat operations and tie units into the area communications system. Multichannel links make use of multiplexing - a system of transmitting several messages over one transmission path can be either radio or wire.

Main Features:

- o Meets increased demand for circuit expansion.
- o Cuts cable cost and maintenance.
- o Can be extended over great distances.

Strong Points:

- o Increased circuits over single path.
- o Increased range.
- o Builds up weak signals.
- o Adds and drops circuits along system.
- o Can be secured.

Directory 1.2 Command System (Continued)

<u>(ITEM, (INTERACTION)</u>	<u>DESCRIPTION</u>	<u>LEVEL 2</u>
	Weak Points:	
	<ul style="list-style-type: none"> <li>o Loss of cable or radio path drops all circuits.</li> <li>o Large equipment reduces mobility.</li> <li>o Large power requirements."</li> </ul>	
(18, 31)	<u>Item:</u> <u>Mechanisms:</u> Same as (18, 27) <u>Factors:</u> <u>Representations:</u> See (9, 31) and (18, 27).	
(18, 32)	Same as (18, 27)	
(18, 33)	Same as (18, 27)	
(18, 34)	Same as (18, 27)	
(19, 27)	<u>Item:</u> Commanders, staff, forces. <u>Mechanism:</u> 3 <u>Factors:</u> 5 <u>Representations:</u> FM 24-1 states,  "Wire and cable are some of the most dependable means of communications.	
	Main Features:	
	<ul style="list-style-type: none"> <li>o Interconnects closely located activities.</li> <li>o Uses field wire and cable, telephones, and switchboards to provide person-to-person conversations.</li> <li>o Joints teletypewriter terminals.</li> <li>o Extends subscriber equipments from multichannel terminals, and provides transmission path for multichannel.</li> <li>o Integrates with radio systems.</li> </ul>	
	Strong Points:	
	<ul style="list-style-type: none"> <li>o More secure than radio.</li> <li>o Reduces the probability of interceptions.</li> <li>o Key in river crossings.</li> <li>o Commercial circuits can be exploited.</li> <li>o Desirable in defensive operations.</li> <li>o Backup for radio.</li> <li>o Used during surprise attack.</li> </ul>	

Directory 1.2 Command System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	Weak Points:	
	<ul style="list-style-type: none"> <li>o Compared to radio, wire requires more time, men and equipment to install and maintain.</li> <li>o Loss of signal over long distances.</li> <li>o Subject to damage from tracked and wheeled vehicles.</li> <li>o Subject to wiretap.</li> <li>o Not a workable means when the force or stations is/are mobile."</li> </ul>	
(19, 31)	Same as (19, 27)	
(19, 32)	Same as (19, 27)	
(19, 33)	Same as (19, 27)	
(19, 34)	Same as (19, 27)	
(20, 27)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanisms:</u> 3  <u>Factors:</u> 5  <u>Representations:</u> FM 24-1 outlines the use of teletype:      "Teletypewriter provides a rapid method of transmitting messages over multichannel circuits or by radio (RATT). Messages are received in the form of page copy or paper tape.</p>	
	Main Features:	
	<ul style="list-style-type: none"> <li>o Variable speeds</li> <li>o Accuracy</li> <li>o Page copy of message</li> </ul>	
	Strong Points:	
	<ul style="list-style-type: none"> <li>o Easy to secure</li> <li>o Easily retransmitted</li> <li>o Point to point</li> <li>o Links to higher, lower, and adjacent headquarters</li> <li>o RATT is backup to multichannel radio, tropo, satellite, and cable links</li> <li>o Alert warning</li> <li>o Rear area security control</li> </ul>	

Directory 1.2 Command System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	Weak Points:	
	<ul style="list-style-type: none"> <li>o Needs higher quality circuits than voice</li> <li>o Increased equipment requires more power and maintenance than a simpler means."</li> </ul>	
(20, 32)	Same as (20, 27)	
(20, 33)	Same as (20, 27)	
(21, 27)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanisms:</u> 3  <u>Factors:</u> 5</p> <p><u>Representations:</u> Ground based, man transportable satellite receivers are increasing the use of satellites for combat communications. FM 24-1 outlines satellite capabilities:</p> <p>"The communications satellite acts as a repeater station in the sky. Technology has brought us to the stage where we now have man-pack equipment for TACSATCOM.</p> <p><u>Main Features:</u></p> <ul style="list-style-type: none"> <li>o Single repeater to connect remote sites</li> <li>o High data rate</li> <li>o Difficult to jam</li> <li>o Remote multiple access (simultaneous links)</li> </ul> <p><u>Strong Points:</u></p> <ul style="list-style-type: none"> <li>o Mobile</li> <li>o Rapid terminal installation</li> <li>o Secure circuits</li> <li>o Built-in test equipment</li> <li>o Elimination of ground relay</li> <li>o Site location not restricted by terrain</li> </ul> <p><u>Weak Points:</u></p> <ul style="list-style-type: none"> <li>o Needs wide frequency bands</li> <li>o Requires redundancy for reliability</li> <li>o Frequencies must be high enough to prevent reflection from ionosphere</li> <li>o Rain causes loss in signal strength."</li> </ul>	

Directory 1.2 Command System (Continued)

(ITEM, INTERACTION)	<u>DESCRIPTION</u>	LEVEL 2
(21, 32)	Same as (21, 27)	
(21, 34)	Same as (21, 27)	
(22, 27)	<p><u>Item:</u> Commanders, staff, forces.</p> <p><u>Mechanism:</u></p> <p><u>Factors:</u></p> <p><u>Representations:</u> FM 24-1 states,</p> <p>"A messenger provides a method of sending and receiving documents by physical means. We must make greater use of messengers when it's practical, because of the increasing dangers in the electromagnetic environment.</p> <p><b>Main Features:</b></p> <ul style="list-style-type: none"> <li>o Available to all units.</li> <li>o Reliable.</li> <li>o Flexible.</li> <li>o Most secure means available to all units.</li> <li>o Types:           <ul style="list-style-type: none"> <li>Schedules messengers</li> <li>Special messengers</li> </ul> </li> <li>o Modes:           <ul style="list-style-type: none"> <li>Motor</li> <li>Air</li> <li>Foot</li> </ul> </li> </ul> <p><b>Strong Points:</b></p> <ul style="list-style-type: none"> <li>o Handles:           <ul style="list-style-type: none"> <li>Long messages</li> <li>Large size maps</li> <li>High volume routine messages</li> </ul> </li> <li>o Very secure</li> </ul> <p><b>Weak Points:</b></p> <ul style="list-style-type: none"> <li>o Requires more time to deliver.</li> <li>o Subject to enemy action.</li> <li>o Physical limits on modes of transportation:           <ul style="list-style-type: none"> <li>Weather</li> <li>Terrain</li> </ul> </li> <li>o Lack of person-to-person conversation."</li> </ul>	

Directory 1.2 Command System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2												
(22, 31)	Same as (22, 27)													
(22, 32)	Same as (22, 27)													
(22, 33)	Same as (22, 27)													
(22, 34)	Same as (22, 27)													
(23, 27)	<p><u>Item:</u> Commanders, staff, forces.</p> <p><u>Mechanism:</u> 3</p> <p><u>Factors:</u> 5</p> <p><u>Representations:</u> FM 24-1 gives the following description:</p> <p>"The use of visual and sound communications is becoming more and more important as Electronic Warfare activities increase. All the combat arms are placing greater emphasis during training on the use of visual and sound means.</p>													
	<p><b>Main Features:</b></p> <ul style="list-style-type: none"> <li>o Available to all.</li> <li>o Numerous means:           <table> <tbody> <tr> <td>Flags</td> <td>Armbands</td> </tr> <tr> <td>Lights</td> <td>Horns</td> </tr> <tr> <td>Panels</td> <td>Bells</td> </tr> <tr> <td>Arm and hand signals</td> <td>Whistles</td> </tr> <tr> <td>Aircraft maneuvers</td> <td>Weapons fire</td> </tr> <tr> <td>Pyrotechnics</td> <td>Sirens</td> </tr> </tbody> </table> </li> </ul>	Flags	Armbands	Lights	Horns	Panels	Bells	Arm and hand signals	Whistles	Aircraft maneuvers	Weapons fire	Pyrotechnics	Sirens	
Flags	Armbands													
Lights	Horns													
Panels	Bells													
Arm and hand signals	Whistles													
Aircraft maneuvers	Weapons fire													
Pyrotechnics	Sirens													
	<p><b>Strong Points:</b></p> <ul style="list-style-type: none"> <li>o Used to mark locations.</li> <li>o Good for passing information to large numbers and to isolated units.</li> <li>o Used in passage of lines.</li> <li>o Used in link-up operations.</li> <li>o Don't need electricity.</li> <li>o Don't use electromagnetic emissions.</li> </ul>													
	<p><b>Weak Points:</b></p> <ul style="list-style-type: none"> <li>o Easily misunderstood.</li> <li>o Vulnerable to interceptions.</li> <li>o Enemy may use same signal for deception.</li> <li>o Restricted use during poor visibility or combat noise.</li> <li>o Sounds easily confused with other battlefield noises."</li> </ul>													

TABLE 1.3 SUPPORT SYSTEM

ITEM	INTERACTION				LEVEL 1										LEVEL 2																				
	DAMAGE	SUPPRESS	DETECT	DELAY	DIVERT	DECEIVE	SUPPORT	COMMUNICATE	DIVERT	DECEIVE	SUPPORT	COMMUNICATE	DIVERT	DECEIVE	SUPPORT	COMMUNICATE	DIVERT	DECEIVE	SUPPORT	COMMUNICATE	DIVERT	DECEIVE	SUPPORT	COMMUNICATE	DIVERT	DECEIVE	SUPPORT	COMMUNICATE	DIVERT	DECEIVE	SUPPORT	COMMUNICATE			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
<b>SUPPLIES</b>																																			
1	POL/GENERATORS																																		
2	AMMUNITION																																		
3	REPAIR PARTS																																		
4	FOOD/WATER/MED																																		
5	ENG/BUILDING																																		
6	MAJOR END ITEMS																																		
7	REPLACEMENT PER PERSONNEL																																		
8	SUPPLY																																		
9	TRANSPORT																																		
10	MAINTENANCE																																		
11	ENGINEER																																		
12	FOOD, MEDICAL																																		
13	ADDITIONAL EQUIP.																																		
14	COMPUTERS																																		
15	COMMUNICATIONS																																		
16	SUPPORT CENTERS																																		
17	EQUIPMENT																																		
18	DEPOSITS																																		
19	POL																																		
20	AMMUNITION																																		
21	HOSPITALS																																		
22	WATER TANKS																																		
23	DECONJAM TRUCKS																																		
24	RAIL/AIRFIELDS																																		
25	FOOD																																		
26	ENVIRONMENT																																		
27	SENSOR																																		
28	SUPPORT																																		
29	COMMAND																																		
30	WEAPON																																		

Directory 1.3 Support System

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(1, 26)	<p><u>Item:</u> Vehicles  <u>Mechanism:</u> 8  <u>Factors:</u> 5</p> <p><u>Representations:</u> POL includes motor gasoline (MOGAS), diesel fuel, aviation gasoline (JP), greases, oils and lubricants. Fuel is handled by the theater level petroleum distribution system. Greases, oils and lubricants are packaged products and are distributed in response to single line item requisitions.</p>	
(1, 27)	<p><u>Item:</u> Command posts, vehicles  <u>Mechanism:</u> 8  <u>Factors:</u> 5</p> <p><u>Representations:</u> Includes generators as well as POL</p>	
(1, 28)	Same as (1, 26)	
(1, 29)	<p><u>Item:</u> Sensors, vehicles  <u>Mechanism:</u> 8  <u>Factors:</u> 5</p> <p><u>Representations:</u> Includes generators as well as POL</p>	
(2, 26)	<p><u>Item:</u> Weapons  <u>Mechanism:</u>  <u>Factors:</u></p> <p><u>Representations:</u> Ammunition resupply is critical for effective combat. The following description of ammunition resupply is given in FM 100-10:</p> <p>Operationally, conventional ammunition service is a combination of supply action by logistical elements and control by tactical commanders. The supply action includes the functions needed to keep basic loads and theater ammunition stocks at prescribed levels. These functions are to requisition, receive, store, and issue ammunition resupply; they occur as follows:</p> <ul style="list-style-type: none"> <li>o Ammunition is shipped from CONUS via containership or break-bulk transport.</li> <li>o It is moved through fixed ports or over the shore using materials handling equipment.</li> <li>o The bulk of this ammunition is routed by rail or truck to corps storage areas (CSA), although some may be shipped directly to ASPs (ammunition storage points). From the CSAs, ammunition is shipped either to ASPs, or in the case of the CSAs, it may be shipped directly to ATPs (ammunition transfer points).</li> </ul>	

Directory 1.3 Support System (Continued)

<u>(ITEM, (INTERACTION)</u>	<u>LEVEL 2</u>
<u>DESCRIPTION</u>	
	<p>ASPs are established as close to be tactical units as practical. In some cases, they may located in divisional areas; however, the corps is still responsible for receiving, storing, and issuing the ammunition. The ATPs are located well forward in the divisional area. Normally there is an ATP in each of the brigade support areas. ATPs receive selected high-tonnage items, such as artillery and tank main gun ammunition on semitrailers, and transfer the ammunition to the tactical units' vehicles.</p> <ul style="list-style-type: none"> <li>o The conventional ammunition service support structure is responsible for supplying medium cost, high-density missile ammunition such as tube-launched, optically-tracked, wire-guided missile (TOW), REDEYE, STINGER, and CHAPARRAL in the theater of operations. The CSA will also supply Hawk, Patriot, and nonnuclear Lance (warheads and missile main assemblies (MMAs)) to air defense and field artillery battalions.</li> <li>o The special ammunition support structure provides users with high-cost, low-density missiles such as nuclear Lance (warhead and MMAs).</li> </ul>
(3, 26)	<p><u>Item:</u> Weapons, vehicles  <u>Mechanism:</u> 8  <u>Factors:</u> 5  <u>Representations:</u> Like ammunition and fuel, repair parts are critical for the on-going operation of weapon systems. A large number of these repair parts are routinely supplied from the continental U.S. by air lines and are then transferred directly to the requesting unit.</p>
(3, 28)	<p><u>Item:</u> Vehicles  <u>Mechanism:</u>  <u>Factors:</u> Same as (3, 26)  <u>Representations:</u></p>
(3, 29)	<p><u>Item:</u> Sensors, vehicles  <u>Mechanism:</u>  <u>Factors:</u> Same as (3, 26)  <u>Representations:</u></p>
(4, 26)	<p><u>Item:</u> Personnel (and equipment requiring decontamination)  <u>Mechanism:</u> 8  <u>Factors:</u> 5  <u>Representations:</u> Food, water and medical supplies are required to adequately sustain fighting forces over a period of time. Water supply is traditionally an engineer</p>

Directory 1.3 (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	responsibility, though this responsibility may change in the near future. Note that a large volume of water is required to decontaminate equipment that has been exposed to NBC environment.	
(4, 27)	Same as (4, 26)	
(4, 28)	Same as (4, 26)	
(4, 29)	Same as (4, 26)	
(6, 26)	<u>Item:</u> Weapons, vehicles <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> Includes large replacement items such as tanks and trucks. Transportation of these items is normally by ships, rail and HETs (heavy equipment transporters).	
(6, 28)	<u>Item:</u> Vehicles <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> Includes trucks, tankers, etc.	
(6, 29)	<u>Item:</u> Vehicles, sensors <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> Includes trucks, radars, etc.	
(7, 26)	<u>Item:</u> Personnel <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> New personnel usually enter the combat zone at the corps rear and are then transported to the division rear CP where they are assigned to brigades and individual weapons. Transportation is usually by truck or APCs.	
(8, 26)	<u>Item:</u> Weapons, vehicles, personnel <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> FM 100-10 states,  "To prepare for an attack, CSS (combat service support) elements make sure that all support equipment is ready, that sufficient transportation is available to support the tactical and logistical plans, and that all CSS elements are informed	

Directory 1.3 Support System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>as to their responsibilities in the operation. Consideration must be given to the nature of offensive operations as it affects CSS operations. Although ammunition expenditure is typically lower in the offensive than in other types of operations, responsive support is critical and is made more difficult by lengthening of the supply lines and by the critical requirements for user resupply vehicles to stay close to the firing elements. While fuel consumption usually decreases during the defensive battle, ammunition usage will increase. In preparing for combats the following must be considered.</p> <ul style="list-style-type: none"> <li>o Ammunition is placed close to the user.</li> <li>o Ammunition supply points (ASPs) and ammunition transfer points (ATPs) are positioned forward to best support the forces.</li> <li>o Ammunition is stockpiled at designated firing positions.</li> <li>o Provisions are made to move class V [ammunition] forward with advancing elements and to ensure that basic loads can be replenished quickly.</li> <li>o Weapon systems are fully armed prior to the attack."</li> </ul> <p>Corps personnel (headquarters at COSCOM) include the corps POL Supply Battalion and Ammunition Battalion. Division personnel (headquarters at DISCOM) include the division Supply and Service Company. In light of threat doctrine targeting rear area operations, CSS survivability at corps and division level is increased by locating these personnel in bases. These bases are geographically small and easily defensible with a clearly defined perimeter and established access controls. At the brigade and lower echelons, personnel, vehicles and equipment are combined into trains. As described in FM 100-10, "Unit trains generally permit centralized coordination and control of combat service support, assets and provide an enhanced security capability. The echelonnement of units into combat and field trains provides more responsive CSS support during rapid movement and, by separating the units, provides increased survivability of assets. Ideally, the location of the trains should have --</p> <ul style="list-style-type: none"> <li>o Defensible terrain</li> <li>o Sufficient space to permit dispersion</li> <li>o Concealment from hostile observation</li> <li>o Firm ground for vehicles</li> <li>o A water source</li> <li>o A suitable helicopter landing site</li> <li>o A good road net</li> <li>o Accessible communications</li> </ul>	

Directory 1.3 Support System (Continued)

<u>(ITEM, INTERACTION)</u>	<u>LEVEL 2</u>
<u>DESCRIPTION</u>	
	Built-up areas may be good candidates for trains locations because they provide cover and concealment and shelter for maintenance operations at night. When built-up areas are used, trains elements should occupy buildings near the edge of the area to reduce the chance of being trapped. Proper positioning of the trains can also help to minimize displacements and thus increase the amount and quality of support."
(8, 27)	See (8, 26)
(8, 29)	See (8, 26)
(8, 32)	<u>Item:</u> Staff, forces <u>Mechanism:</u> 3 <u>Factors:</u> 5 <u>Representations:</u> See (16, 33)
(9, 26)	<u>Item:</u> Weapons, personnel <u>Mechanism:</u> 2 <u>Factors:</u> 3 <u>Representations:</u> At corps, personnel include the Motor Transport Bn and Aviation Bn. At division, personnel include the Transportation Motor Transport Co. The brigade has a forward attachment of the division personnel. FM 100-10 says, "Transportation resources can be expected to be heavily taxed in the offense. Wide dispersion of units and lengthening lines of communication (LOC), coupled with an increased requirement for has several characteristics, among which are the following: <ul style="list-style-type: none"> <li>o Supply activity will be greatest in the preparation stage. Stockpiling far forward and at successive defensive positions.</li> <li>o Positioning of facilities/installations should be far enough in the rear to be out of the flow of battle and relatively secure but not so far as to render the logistics effort less effective.</li> <li>o Provision of maintenance forward to return the maximum number of weapon systems to the battle as soon as possible.</li> </ul> Transportation resources are also most critically needed in the preparation stage of the defense. They are required for the stockpiling of supplies discussed previously. They may also be required to shift personnel, weapon systems, and supplies laterally or in depth to meet the probable points of

Directory 1.3 Support System (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	enemy attack. Meanwhile, while conducting the defense, planning for the use of transportation in subsequent offensive or retrograde operations is to our advantage."	
(9, 27)	<u>Item:</u> Commanders, staff <u>Mechanism:</u> 2 <u>Factors:</u> 3 <u>Representations:</u> Moves main and rear command posts at corps and division levels	
(9, 32)	Same as (8, 32)	
(10, 26)	<u>Item:</u> Weapons, vehicles <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> The primary thrust of the maintenance effort is to have the maximum number of weapon systems ready before the battle and, once the battle begins, to repair the maximum number of damaged/inoperable systems and to return them to the battle as quickly as possible. This thrust makes it mandatory that maintenance be provided at, or as near as possible to, the intended area of operation of the system. As in all other types of operations, it requires highly trained personnel able to diagnose problems quickly, to make rapid repairs, and/or make the decision to evacuate equipment to the next level of maintenance.  The FAROs outline maintenance as follows:  There are three types of maintenance service - general support, direct support, and organizational. General support is the highest level of maintenance support and handles the overflow from direct support units; direct support is provided to specific units as a backup for organizational maintenance; and organizational maintenance is that which is performed by the using units.	
(10, 27)	<u>Item:</u> Vehicles <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> Primarily vehicles	
(10, 29)	<u>Item:</u> Sensors, vehicles <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> Specialized, difficult to replace personnel are required to maintain sensors	

Directory 1.3 Support System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(10, 32)	Same as (8, 32)	
(11, 16)	<u>Item:</u> Weapons, vehicles <u>Mechanism:</u> 11 <u>Factors:</u> 2 <u>Representations:</u> Countermobility includes the construction of obstacles such as mines, abatis, boobytraps and craters and the destruction of roads or bridges.	
(11, 26)	<u>Item:</u> Weapons, vehicles <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> Mobility engineering consists of road or bridge construction.	
(11, 32)	Same as (8, 32)	
(12, 26)	<u>Item:</u> Personnel <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> Food service operates routinely when the tactical situation permits. During offensive operations, high injury and casualty rates will tax medical evacuation and treatment resources. During defensive operations it is important to locate hospitals away from points of possible enemy penetration.	
(12, 32)	Same as (8, 32)	
(13, 26)	<u>Item:</u> Weapons, vehicles <u>Mechanism:</u> 8 <u>Factors:</u> 5 <u>Representations:</u> Includes mobility engineering equipment	
(13, 28)	<u>Item:</u> Support system <u>Mechanism:</u> 2 <u>Factors:</u> 3 <u>Representations:</u> Vehicles	
(14, 33)	<u>Item:</u> Support personnel <u>Mechanism:</u> 3 <u>Factors:</u> 5 <u>Representations:</u> Computers are located at COSCOM and DISCOM. FM 71-100 describes the use of computers for resupply purposes:	

Directory 1.3 Support System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>Some information of a recurring nature can be provided by automated data processing (ADP) equipment. Information normally stored in this equipment includes:</p> <ul style="list-style-type: none"> <li>o Major end items—quantities, location, and status</li> <li>o Repair parts—quantities, location, demand, and full data</li> <li>o Personnel—strengths, casualty, and replacement data</li> <li>o Maintenance management—input and output of shops</li> </ul> <p>ADP equipment sites should be protected and procedures established for access to alternative ADP equipment should present equipment become inoperative.</p>	
(15, 32)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanism:</u> 3  <u>Factors:</u> 5  <u>Representations:</u> Includes COSCOM signal center, DISCOM signal center and brigade train signal centers</p>	
(15, 33)	Same as (15, 32)	
(16, 33)	<p><u>Item:</u> Personnel  <u>Mechanism:</u> 3  <u>Factors:</u> 5  <u>Representations:</u> As described in FM 71-100, "Much information of a critical nature, such as status of fuel, ammunition, operational weapon systems, and crews, can come from a good battlefield information-reporting system. Other information is provided through the administrative/logistics net over radio teletype (RATT) equipment. Information is normally transmitted over this net in the form of standardized reports or requests for assistance. It is usually more detailed although less timely than that which can be obtained through a battlefield information-reporting system. Combat service support information can sometimes be delayed due to pressing tactical requirements. When this is the case, messenger service, normally used for bulk traffic, may be the fastest and the most secure means to transmit information."</p>	
(17, 28)	<p><u>Item:</u> Supply personnel  <u>Mechanism:</u> 2  <u>Factors:</u> 5  <u>Representations:</u> Should include pipelines, bulk resupply vehicles and mobile filling stations</p>	

Directory 1.3 Support System (Continued)

<u>(ITEM, (INTERACTION)</u>	<u>LEVEL 2</u>
<u>DESCRIPTION</u>	
(18, 28)	<u>Item:</u> Supply personnel <u>Mechanism:</u> 2 <u>Factors:</u> 5 <u>Representations:</u> Includes corps ammunition centers, ASPs and ATPs
(19, 28)	<u>Item:</u> Medical support personnel <u>Mechanism:</u> 2 <u>Factors:</u> 5 <u>Representations:</u> Corps hospitals are located at the corps rear command post. The division has aid stations at its main command post.
(20, 28)	<u>Item:</u> Engineer personnel <u>Mechanism:</u> 2 <u>Factors:</u> 5 <u>Representations:</u> Mostly mobile units
(21, 28)	Same as (20, 28)
(22, 28)	<u>Item:</u> Transport personnel <u>Mechanism:</u> 2 <u>Factors:</u> 5 <u>Representations:</u> Railroads are primarily provided by the host country; airfields may be constructed (usually in corps rear area).
(23, 28)	<u>Item:</u> Support personnel <u>Mechanism:</u> 2 <u>Factors:</u> 5 <u>Representations:</u> Tactical situation determines availability

TABLE 1.4 SENSOR SYSTEM

## Directory 1.4 Sensor System

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(1, 11)	<p><u>Item:</u> Weapons, vehicles  <u>Mechanism:</u> 6  <u>Factors:</u> 4  <u>Representations:</u> RB 30-6 provides the following general description of radars:</p> <p>Radars fall into four groups, ground surveillance radars (GSR), counter-fire radars (CFR), side-looking airborne radars (SLAR), and air defense radars (ADR). Each of these groups has a unique intelligence information collection capability. The ground surveillance radar is ground based and detects and locates moving ground targets. The counter-fire radars locate firing mortars, cannons, and rocket launchers by detecting and describing the trajectories of their projectiles. These radars are also capable of supporting friendly artillery weapons by adjustment of their fires and providing technical data to improve their gunnery. The side-looking airborne radar is mounted on an aerial platform and can provide two types of sensings. Fixed target indicators (FTI) provide a radar picture of the terrain. The moving target indicator (MTI) mode provides detection of activity in the target area of interest. Finally, air defense radars are designed to detect and track aircraft. Many of these radars have a friend or foe identification capability. Recently the combat development community has seen a possible potential for these radars in the intelligence functional area in that analysis of air traffic patterns may provide clues as to size, location, and intent of an enemy effort.</p>	
(1, 13)	<p><u>Item:</u> Vehicles, vehicle trains  <u>Mechanism:</u> 6  <u>Factors:</u> 4  <u>Representations:</u> GSRs</p>	
(1, 14)	<p><u>Item:</u> Vehicles  <u>Mechanism:</u> 6  <u>Factors:</u> 4  <u>Representations:</u> GSRs</p>	
(1, 15)	<p><u>Item:</u> Weather  <u>Mechanism:</u> 6  <u>Factors:</u> 4  <u>Representations:</u> Used to obtain meteorological data for artillery units</p>	

Directory 1.4 Sensor System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(1, 24)	<u>Item:</u> Sensors <u>Mechanism:</u> 6 <u>Factors:</u> 4 <u>Representations:</u> Decoy radars	
(2, 11)	<u>Item:</u> Weapons, vehicles <u>Mechanism:</u> 6 <u>Factors:</u> 4 <u>Representations:</u> Technology for passive (nonemitting) IR systems is currently under development. RB 30-6 describes the presently employed IR sensors:  The infrared sensor used by the Army is the AN/AAS-14 improved. The IR sensor is not an area surveillance device, as it scans directly along the flight path of the aircraft and has operational altitude limitations (usually below 3,000 feet). Infrared missions are usually executed during hours of darkness as the cooling of the ground permits a larger heat emission differential from "hot targets." The system is not all weather in that it will not receive missions through heavy cloud layers or dense vegetation canopy. IR should supplement other sensor imagery. It has the capability to penetrate camouflage and is completely passive in nature. A ground data link system for the OV-10 IR sensor is currently under R&D. Characteristics of the airplane carrying these sensors must be detailed.	
(2, 13)	<u>Item:</u> Vehicle trains <u>Mechanism:</u> 6 <u>Factors:</u> 4 <u>Representations:</u> See (2, 11)	
(2, 15)	Same as (1, 15)	
(3, 11)	<u>Item:</u> Weapons <u>Mechanism:</u> 6 <u>Factors:</u> 4 <u>Representations:</u> Sound ranging equipment cannot be detected by enemy. Sound ranging is used by artillery units to locate mortars, air defense and artillery. The capabilities are limited by wind, combat noise and terrain. In general sound ranging is less accurate than radar detection.	

Directory 1.4 Sensor System (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(4, 11)	<p><u>Item:</u> Weapons, vehicles  <u>Mechanism:</u> 6  <u>Factors:</u> 4  <u>Representations:</u> Image intensification devices are nonemittive. The following description is from RB 30-6:</p> <p>Image intensification devices (IID) are a technological breakthrough that was exploited for the war in Southeast Asia. These devices acquire the available light reflected on the target and through an electro-optical process, project an image on a cathode for the viewer.</p> <p>These devices are still dependent on light, ambient or projected (to include IR), but can operate under very low conditions of light intensity. As previously mentioned, the ambient light level can be increased by offset illumination flares or defused searchlights to compensate for extremely low light levels such as moonless nights with 100% cloud cover. These IIDs can be configured as goggles, sights, or surveillance devices.</p> <p>Most operational tests of these devices indicate a high level of troop acceptance since their presentation to the operator is generally in common reference visual terms. These devices do however tend to induce operator concentration and physical contact. In the case where binocular viewing and hands off operation are achieved this problem is lessened.</p>	
(4, 13)	<p><u>Item:</u> Vehicle trains  <u>Mechanism:</u> 6  <u>Factors:</u> 4  <u>Representations:</u> Same as (4, 11)</p>	
(5, 11)	<p><u>Item:</u> Weapons, vehicles  <u>Mechanism:</u> 6  <u>Factors:</u> 4  <u>Representations:</u> Unattended ground sensors are frequently used by maneuver units to obtain combat intelligence. According to RB 30-6, "[Unattended ground sensors] may be seismic, which is influenced by target movement over ground; infrared, which detects ambient heat difference between the air and the target; acoustic, which detects the noise created by the target and which is usually triggered by the seismic sensor; magnetic, which is influenced by the movement of ferrous metal; or electromagnetic, which detects the movement of the target through an electromagnetic field. The second</p>	

Directory 1.4 Sensor System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	part of the system, the relay, helps to overcome line-of-sight communications problems and enhances the range capability of unattended ground or remote sensors. Maximum ranges on the order of 250 miles can be obtained with relays. The last portion of the system, the monitor, allows the operator to receive the sensor signal for analysis on the audio and visual display systems of the monitor. The on-line hard copy recorder allows the operator to analyze the target in terms of convoy size, speed, direction, and possibly content . . .	
	Sensors are usually placed in a linear arrangement along avenues of approach and lines of communication. Normal configuration calls for seismic sensors at each end of the string with target confirmation sensors of other types in the center of the string. There is usually a minimum of five sensors in a string."	
	Remotely piloted vehicles (RPVs) are used by artillery units. FM 6-20 describes these devices:	
	The remotely piloted vehicle system is designed to provide real-time target acquisition and combat information beyond the line of sight of supported ground forces. The system can detect, recognize, and identify targets and assist artillery engagement out to 20 km forward of the line of contact (LC). Combat effectiveness will be increased, especially against cold, nonmoving, nonemitting targets, while the exposure of manned aircraft to the enemy will be reduced. The system can perform airborne target acquisition, adjustment of FA fires, laser designation for all triservices precision guided munitions, reconnaissance, and damage assessments.	
(5, 13)	Same as (5, 11)	
(6, 11)	<u>Item</u> : Weapons, vehicles <u>Mechanism</u> : 6 <u>Factors</u> : 4 <u>Representations</u> : Photographic capabilities include panoramic or strip camera systems. Cameras can use black and white (processed directly by the Army), color, infrared photography or camouflage detection film. RB 30-6 further describes photographic capabilities: The panchromatic black and white film is the least expensive. This film will suffice for most photo missions. Color film	

Directory 1.4 Sensor System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	presents natural tones and enhances the interpreter's ability to recognize objects. Color is particularly useful in terrain and beach analysis. Color is a high cost film. Camouflage detection film is a special type of color film. Vegetation containing chlorophyll will register in tones of red while those without chlorophyll will be recorded as blue, yellow, black/green or white. IR film is a black and white film sensitive to the blue-violet colors of the visible light spectrum and reflected infrared rays. IR photography is useful in haze penetration, night photography, terrain analysis and camouflage detection. All photography except panchromatic (black and white) must be processed in a non-Army facility.	
(6, 13)	Same as (6, 11)	
(7, 12)	<p><u>Item:</u> Communication equipment  <u>Mechanism:</u> 3  <u>Factors:</u> 4</p> <p><u>Representations:</u> Signals intelligence (SIGINT) collectors include COMINT (communications intelligence) sensors (primarily radio receivers) and ELINT (electronic intelligence) sensors (transmitters). In outlining SIGINT collector capabilities, RB 30-6 says,</p> <p>"SIGINT is collected through the use of ground based and airborne systems, each of which has a unique signals intelligence collection capability. Some systems are primarily gross detectors used for cueing of more accurate, but less numerous signals collectors and locators. Enemy signals emissions can be denied to SIGINT collectors through emitter silence or shutting off of the active portion of the system but these countermeasures cost the enemy in terms of his total capability, especially in the areas of early warning radars, fire control, and command and control systems. Thus, through the technique of cueing, scarce assets are not wasted during low intensity periods. The mission of signals collection and signals emitter locating is a dynamic one that requires constant updates of collection planning, allocation of frequencies, equipment positioning, and tactical force intelligence requirements. SIGINT equipment operators and analysts can acquire and process accurate, timely, and tactically valuable enemy information to the supported command. However, when the optimum in positioning, operational requirements, and frequency requirements are given lower priorities, the collectors capability are often greatly</p>	

Directory 1.4 Sensor System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>reduced. SIGINT is vulnerable to enemy deception operations, as information obtained through intercepts and direction locating of receivers which notionally portrays false information will also be collected. Single source dependence should be absolutely avoided. Additionally, offensive use of SIGINT equipment for EW (ECM) causes a degradation of SIGINT as a source of intelligence. When possible, other combat means should be utilized against SIGINT targets. This tradeoff of EMC vs SIGINT must be fully evaluated by the commander."</p>	
(7, 14)	<p><u>Item:</u> Radio transmitters  <u>Mechanism:</u> 6  <u>Factors:</u> 4  <u>Representations:</u> Same as (7, 12)</p>	
(8, 11)	<p><u>Item:</u> Weapons, personnel, vehicles  <u>Mechanism:</u> 3  <u>Factors:</u> 5  <u>Representations:</u> Field artillery operations are supported by forward observers (often located at observation posts). Indeed, the soldier who has seen, heard or otherwise sensed an event on the battlefield is often a valuable source of information. Timelessness and accuracy of these sources of information are functions of training, fatigue and commander management. Intelligence of activities shortly behind enemy lines may be obtained by aerial observers. FM 30-6 outlines sources of information capable of describing activities far behind enemy lines:</p> <p>The most common sources of information for intelligence purposes are activities, prisoners of war, local residents, refugees, evacuees, displaced persons, civilian agencies, recovered US military personnel, captured enemy documents and material . . ."</p>	
(8, 12)	Same as (8, 11)	
(8, 13)	Same as (8, 11)	
(8, 14)	Same as (8, 11)	
(8, 15)	Same as (8, 11)	

Directory 1.4 Sensor System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(9, 11)	<p><u>Item:</u> Weapons, vehicles, personnel (enemy second echelon resources)  <u>Mechanism:</u> 3  <u>Factors:</u> 2,3,4,5  <u>Representations:</u> Includes air defense radar personnel (corps SHORAD FAAR p/t, radar operators) and corps level reconnaissance/surveillance personnel. The FAROs describe the activities of the r/s personnel:</p> <p>Long Range Reconnaissance Patrols (LRRPs) sent behind the front line of troops (FLOT) to report on the enemy's second echelon elements and flanks use tactical radios for reporting of the intelligence gathered. Because of their deep employment, they are vulnerable to capture and compromise. Since LRRP reports are difficult to communicate back to the corps mission management elements due to the ranges involved there is an accentuated need for secrecy to avoid disclosure. Communications relays may be required. LRRP reports include not only enemy situation reports, but action unit status reports and coordination of recovery means.</p> <p>The FAROs also outline the corps Armored Cavalry Squadron and Air Cavalry Troop which are primarily involved in reconnaissance activities. At the corps fusion center, fusion personnel correlate sensor reports. Note that activities of corps personnel are directed primarily to detection in the corps area of interest.</p>	
(9, 12)	<p><u>Item:</u> Vehicles, personnel  <u>Mechanism:</u> 6  <u>Factors:</u> 2,4,5  <u>Representations:</u> POW and civilian interrogation, LRRPs</p>	
(9, 32)	<p><u>Item:</u> Staff, forces  <u>Mechanism:</u> 3  <u>Factors:</u> 5  <u>Representations:</u> Requires dedicated communications between command posts</p>	
(9, 34)	Same as (9, 32)	
(10, 11)	<p><u>Item:</u> Weapons, vehicles, personnel  <u>Mechanism:</u> 6  <u>Factors:</u> 2,3,4,5  <u>Representations:</u> Includes LRRPs (see (9, 11)). The division Target Acquisition Battery (TAB) may be considered as part of</p>	

Directory 1.4 Sensor System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>the sensor system. The FAROs provide the following description:</p> <p>"The principal capability of the TAB is the acquisition of targets, particularly counterfire targets (enemy artillery). Implicit in this capability is the movement and positioning of the unit assets. While interruption in coverage should be modelled, the explicit representation of the sensor moving between positions is not necessary.</p> <p>TAB assets for target acquisition are weapons locating radar sections, moving target locating radar section sound/flash platoon, processing section (considered as part of the targeting element of the divarty TOC), and the communications equipment and personnel to report target acquisition."</p> <p>As with the corps, note that activities of these personnel are directed primarily toward detection in the division area of interest.</p>	
(10, 12)	<p><u>Item:</u> Vehicles, personnel  <u>Mechanism:</u> 6  <u>Factors:</u> 2,4,5  <u>Representations:</u> LRRPs</p>	
(10, 32)	Same as (9, 32)	
(10, 34)	Same as (9, 32)	
(11, 11)	<p><u>Item:</u> Weapons  <u>Mechanism:</u> 6  <u>Factors:</u> 4,5  <u>Representations:</u> Forward observers</p>	
(11, 31)	Same as (9, 32)	
(11, 32)	Same as (9, 32)	
(12, 29)	<p><u>Item:</u> Sensors  <u>Mechanism:</u> 3  <u>Factors:</u> 2,3,4,5  <u>Representations:</u> Monitors and relays for unattended ground sensors, relays for airborne sensors.</p>	
(12, 34)	Same as (12, 29)	

Directory 1.4 Sensor System (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(13, 29)	<p><u>Item:</u> Sensor system staff  <u>Mechanism:</u> 2  <u>Factors:</u> 2,5  <u>Representations:</u> Corps and division both have fusion centers located at the respective main CP. The FAROs outline fusion center activities:</p> <p>"[These units use] sensor reports of all types along with terrain and weather data to determine enemy location, strength, and intent. It uses its own staff and computer data bases to do detailed correlation and aggregation of the reported data. While the standard effects apply, including the high vulnerability of the process to computer damage, the staff involved is very highly skilled and difficult to replace if wounded or killed through enemy action. Should the corps fusion center be degraded more than 50% for more than 8 hours, the EAC fusion center will establish direct channels with the division fusion centers in the corps fusion centers's place."</p>	
(14, 29)	<p><u>Item:</u> Sensors, personnel  <u>Mechanism:</u> 2  <u>Factors:</u> 3  <u>Representations:</u> Jeeps, trucks</p>	
(15, 34)	<p><u>Item:</u> Personnel  <u>Mechanism:</u> 3  <u>Factors:</u> 2,5  <u>Representations:</u> Located at fusion centers; see (13, 29)</p>	
(16, 32)	<p><u>Item:</u> Commanders, staff, forces  <u>Mechanism:</u> 3  <u>Factors:</u> 2,5  <u>Representations:</u> Corps and division signal centers, relays</p>	
(16, 34)	See (9, 32)	

TABLE 1.5 ENVIRONMENT

ITEM	INTERACTION					SUPPRESS					DEFECT					DECEIVE					DELAY					SUPPORT					COMMUNICATE				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
TERRAIN/VEGETATION																																			
1 MOUNTAINS/HILLS																																			
2 PLAINS																																			
3 DESERTS																																			
4 RIVERS/LAKES																																			
5 SWAMPS																																			
6 COASTAL																																			
7 FORESTS/JUNGLES																																			
8 CROPS/GRASSLANDS																																			
9 URBAN																																			
ATMOSPHERE/TIME																																			
10 TEMPERATURE																																			
11 HUMIDITY																																			
12 BAR PRESSURE																																			
13 WIND																																			
14 VISIBILITY																																			
15 STORMS																																			
16 TIME OF DAY																																			
17 TIME OF YEAR																																			
TRAFFICABILITY																																			
18 BRIDGES																																			
19 RAILROADS																																			
20 ROAD NETWORK																																			
21 ROAD CONDITION																																			
BATTLE INDUCED																																			
22 LETHAL																																			
NONLETHAL																																			
ENVIRONMENT																																			
SENSOR																																			
SUPPORT																																			
COMMAND																																			
WEAPON																																			

Directory 1.5 Environment

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(1, 16)	<p><u>Item:</u> Mechanized forces, artillery, communication equipment  <u>Mechanism:</u> 11,9  <u>Factors:</u> 3,4</p> <p><u>Representations:</u> Tanks and APCs can move through rough terrain only on roads. Weapons must use high trajectory angles. Communications are restricted and retransmission may frequently be required. FM 6-20-1 describes mountain/hill environment operations, "The important factors in mountain warfare are the need to control high terrain and restrictions caused by the geography. The geography restricts surface mobility, ground observation in some spots, positions available for field artillery, communications, avenues of approach, and large unit operations. On the other hand, it enhances fighting from high to low levels, using long-range organic fires from high spots, and ambushes on chokepoints.</p> <p>Infantry forces, especially airmobile, are the most effective in mountains.</p> <p>Available roads will be difficult to negotiate and cause many combat service support problems. Security for all convoys will be necessary. Use of air movement is to be expected."</p>	
(1, 17)	See (1, 16)	
(1, 18)	See (1, 16)	
(1, 19)	See (1, 16)	
(3, 16)	<p><u>Item:</u> Vehicles, personnel  <u>Mechanism:</u> 11  <u>Factors:</u> 2,5</p> <p><u>Representations:</u> Wide temperature ranges and abrupt weather changes (clear-to-sandstorm or clear-to-flood) adversely affect personnel and vehicle operation. Camouflage or concealment may be nonexistent. FM 6-20-1 says, "War in the desert is characterized by rapid, mobile operations. These fast-moving battles are more suitable to heavy forces than light forces. The heat and blowing sand will cause tremendous maintenance and personnel problems."</p>	
(3, 17)	See (3, 16)	
(3, 18)	See (3, 16)	
(3, 19)	See (3, 16)	

Directory 1.5 Environment (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
(4, 16)	<p><u>Item:</u> Weapons, vehicles, personnel  <u>Mechanism:</u> 11  <u>Factors:</u> 5</p> <p><u>Representations:</u> FM 6-20-1 notes, "The main considerations for a force involved in river crossing include the following:</p> <ul style="list-style-type: none"> <li>o Elements are canalized at crossing sites and become highly vulnerable.</li> <li>o Crossing resources are usually limited, thus reducing courses of action available to the commander.</li> <li>o Crossing sites need extra protection.</li> <li>o During crossings, the force's combat power is divided between both banks of the river obstacle.</li> <li>o Communications, command control, and traffic management are complex."</li> </ul>	
(4, 17)	See (4, 16)	
(4, 18)	See (4, 16)	
(4, 19)	See (4, 16)	
(5, 16)	<p><u>Item:</u> Mechanized forces  <u>Mechanism:</u> 11  <u>Factors:</u> 3</p> <p><u>Representations:</u> Movement is restricted, visibility limited and logistic support difficult to maintain.</p>	
(5, 17)	<p><u>Item:</u> Communication equipment  <u>Mechanism:</u> 9  <u>Factors:</u> 4</p> <p><u>Representations:</u> Communications may be restricted.</p>	
(5, 18)	See (5, 16)	
(5, 19)	See (5, 17)	
(7, 16)	<p><u>Item:</u> Mechanized forces, communication equipment  <u>Mechanism:</u> 11  <u>Factors:</u> 3,5</p> <p><u>Representations:</u> FM 6-20-1 describes jungle operations as follows:</p> <p>"The two elements of jungle warfare having the greatest effect on military operations are climate and vegetation. These combine to restrict surface moves, observation, fields of</p>	

Directory 1.5 Environment (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	fire, communications, surveillance, and target acquisition. Conversely, they enhance cover and concealment.	
	Equipment used in the jungle requires more constant and thorough maintenance than is needed in most other areas.	
	Light forces, supported by aviation, are the most productive in the jungle. However, elements of a heavy division may be used successfully in selected operations.	
	Road networks are usually scarce, unsecure, and pose a constant threat of enemy ambushes.	
	Air movement and air resupply operations may be required."	
(7, 17)	See (7, 16)	
(7, 18)	See (7, 16)	
(7, 19)	See (7, 16)	
(9, 16)	<u>Item:</u> Weapons, vehicles, personnel <u>Mechanism:</u> 11 <u>Factors:</u> 3 <u>Representations:</u> Urban environments impede target acquisition and communications. Small units must be employed. FM 90-10-1 notes an additional effect:  "A related problem is the stress of urban combat. Continuous close combat, intense pressure, high casualties, the fleeting nature of targets, and fire from an unseen enemy produce psychological strain and physical fatigue. Stress of urban combat places greater importance on the soldiers' and small-unit leaders' morale and the unit's esprit de corps. Stress can be reduced by rotating units that have been committed to heavy fighting out of the frontlines as the situation permits."	
(9, 17)	<u>Item:</u> Communication equipment <u>Mechanism:</u> 9 <u>Factors:</u> 4 <u>Representations:</u> FM 90-10-1 notes, "[A] characteristic of urban combat is degraded radio communications caused by the mass of buildings. This, combined with the difficulty of observation, makes control more difficult. Urban operations require centralized planning and decentralized execution."	

Directory 1.5 Environment (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	Commanders must have faith in their subordinates' initiative and skill, which can only come through training. The state of a unit's training is a vital — occasionally even decisive — factor.	
(9, 18)	See (9, 16)	
(9, 19)	See (9, 17)	
(10, 16)	<u>Item:</u> Weapons, vehicles, personnel <u>Mechanism:</u> 11 <u>Factors:</u> 2,5 <u>Representations:</u> Extreme cold may force troops to spend most of their time surviving and little time fighting. Equipment breakdowns will probably occur more often; some equipment must be kept warm. Extreme heat also degrades equipment and personnel performance.	
(10, 17)	See (10, 16)	
(10, 18)	See (10, 16)	
(10, 19)	See (10, 16)	
(10, 26)	<u>Item:</u> Mechanized forces <u>Mechanism:</u> 2 <u>Factors:</u> 3 <u>Representations:</u> Frozen ground may be more trafficable.	
(10, 28)	See (10, 26)	
(13, 16)	<u>Item:</u> Weapons <u>Mechanism:</u> 11 <u>Factors:</u> 2 <u>Representations:</u> Wind complicates trajectory calculations.	
(14, 16)	<u>Item:</u> Personnel <u>Mechanism:</u> 9 <u>Factors:</u> 4 <u>Representations:</u> Fog, smog, dust, haze	
(15, 6)	<u>Item:</u> Weapons, vehicles, personnel <u>Mechanism:</u> 9 <u>Factors:</u> 2,5 <u>Representations:</u> The FAROs note, "... adverse weather will delay or deny ground movement and/or air flight ... Visibility restriction caused by darkness, or adverse weather	

Directory 1.5 Environment (Continued)

<u>(ITEM, (INTERACTION)</u>	<u>LEVEL 2</u>
<u>DESCRIPTION</u>	
	conditions will hamper weapons effectiveness due to degraded target acquisition, classification and weapons guidance."
(15, 7)	<u>Item:</u> Communication equipment <u>Mechanism:</u> 9 <u>Factors:</u> 2,5 <u>Representations:</u> Electric storms in particular cause attenuation of communication signals.
(15, 16)	<u>Item:</u> Vehicles, personnel <u>Mechanism:</u> 11 <u>Factors:</u> 3 <u>Representations:</u> Snow, mud, flooded areas
(15, 17)	See (15, 7)
(15, 18)	See (15, 16)
(15, 19)	See (15, 7)
(16, 16)	<u>Item:</u> Weapons, vehicles, personnel <u>Mechanism:</u> 9 <u>Factors:</u> 2 <u>Representations:</u> At night, target acquisition is complicated by the difficulty of identifying friend or foe. Also, human efficiency is reduced by the inability to see. However, attack at night may be beneficial as noted by FM 71-100, "Offensive operations during such periods provide the advantage of striking a defender when the range of his observation and weapons is reduced, and mutual support between positions is limited. Such operations may be conducted to: <ul style="list-style-type: none"> <li>o achieve surprise,</li> <li>o exploit earlier success,</li> <li>o maintain momentum, and</li> <li>o rupture strong enemy defenses."</li> </ul>
(16, 18)	Same as (16, 16)
(17, 16)	<u>Item:</u> Vehicles, weapons, personnel <u>Mechanism:</u> 11,9 <u>Factors:</u> 2,3,5 <u>Representations:</u> Change or seasonal storms may be increased.
(17, 18)	Same as (17, 16)

Directory I 5 Environment (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(18, 16)	<u>Item:</u> Vehicles, weapons, personnel <u>Mechanism:</u> 11 <u>Factors:</u> 3 <u>Representations:</u> Countermobility	
(18, 18)	Same as (18, 16)	
(18, 26)	<u>Item:</u> Vehicles, weapons, personnel <u>Mechanism:</u> 2 <u>Factors:</u> 3 <u>Representations:</u> Mobility	
(18, 28)	Same as (18, 26)	
(19, 16)	Same as (18, 16)	
(19, 18)	Same as (18, 18)	
(19, 26)	Same as (18, 26)	
(19, 28)	Same as (18, 28)	
(20, 16)	<u>Item:</u> Vehicles, weapons <u>Mechanism:</u> 11 <u>Factors:</u> 3 <u>Representations:</u> Congestion points	
(20, 18)	Same as (20, 16)	
(20, 26)	Same as (18, 16)	
(20, 28)	Same as (18, 28)	
(21, 16)	Same as (18, 16)	
(21, 18)	Same as (18, 18)	
(21, 26)	Same as (18, 26)	
(21, 28)	Same as (18, 28)	
(22, 1)	<u>Item:</u> Weapons, vehicles, personnel <u>Mechanism:</u> 4 <u>Factors:</u> 2 <u>Representations:</u> The nuclear environment can severely degrade operations. FM 100-5 describes the after effects of the use of nuclear and chemical fires:	

Directory 1.5 Environment (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	"Nuclear weapons can cause tree blowdown, urban destruction, fires, radiological contamination, and in some cases, flooding. EMP from a nuclear explosion can burn out unshielded electronic equipment, including radars, weapon systems, data processing, and communications systems. Nuclear weapons also produce long-term residual radiation from fallout or rainout.	
	Chemical weapons can also produce immediate and delayed effects. They contaminate individuals, terrain, equipment, and supplies. Prompt use of protective equipment and shelters will significantly reduce casualties. But using protective equipment and shelters can also reduce individual and unit efficiency.	
	In the past, some units have continued to fight effectively despite losing many personnel and much equipment over a long period. On the next battlefield, however, nuclear weapons and chemical agents may inflict large losses very quickly. Such large and sudden losses will likely shock and confuse poorly trained or psychologically unprepared troops.	
	In addition to taking immediate losses, units suffering such attacks will be weakened by long-lasting effects. Long-term residual radiation can contaminate supplies, facilities, equipment, terrain, and uncovered food and water. Soldiers exposed to different levels of radiation will vary in effectiveness. Wearing chemical protective clothing or operating for long times in contaminated environments will also affect performance. Merely carrying out normal body functions will be tedious and time-consuming. Commanders must apply the proper mission-oriented protection with the mission. They must minimize chemical casualties on one hand and reduce heat and fatigue casualties on the other."	
	FM 6-20-1 details MOPP procedures:	
	<ul style="list-style-type: none"> <li>o All radios except those in the fire direction center and tactical operations center will be turned off, disconnected from antenna and stored in an armored vehicle.</li> <li>o Off-duty personnel will occupy foxholes with at least 18 inches of overhead cover.</li> <li>o All messing will be accomplished only in enclosed areas.</li> <li>o Radiological survey teams will monitor the area from date-time group to DTG.</li> </ul>	

Directory 1.5 Environment (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"> <li>o All vehicles will be closed to dust with all doors, windows, hatches, and canvas tightly secured.</li> </ul> <p>Also note that battle-induced fire can damage weapons and personnel.</p>	
(22, 2)	<p><u>Item:</u> Vehicles, personnel  <u>Mechanism:</u> 4  <u>Factors:</u> 2</p> <p><u>Representations:</u> FM 100-5 explains, "The effects of nuclear and chemical weapons will dramatically affect the control of forces. Command posts will be prime targets for attack. Even within small units, control will be difficult. Soldiers and leaders who are wearing protective equipment will be difficult to recognize. Leaders will have to cope with the additional burden of protective equipment while they perform their duties. Inexperienced or poorly trained small-unit leaders could become so concerned about their own welfare that they cease to function as leaders. Only cohesive, disciplined, and well-trained units can function in such an environment."</p>	
(22, 3)	Same as (22, 1)	
(22, 4)	See (22, 2)	
(22, 6)	See (22, 1)	
(22, 7)	See (22, 2)	
(22, 8)	See (22, 3)	
(22, 9)	See (22, 4)	
(22, 16)	See (22, 1)	
(22, 17)	See (22, 2)	
(22, 18)	See (22, 3)	
(22, 19)	See (22, 4)	
(23, 16)	<p><u>Item:</u> Weapons, vehicles, personnel  <u>Mechanism:</u> 11  <u>Factors:</u> 2</p> <p><u>Representations:</u> Smoke and dust from exploding shells impeded target acquisition and movement.</p>	

Directory 1.5 Environment (Continued)

<u>(ITEM, INTERACTION)</u>	<u>DESCRIPTION</u>	LEVEL 2
(22, 18)	See (23, 16)	

**TABLE 2 COMMAND AND CONTROL ITEM/INTERACTIONS**

ITEM	INTERACTION					LEVEL 1 (OVERVIEW)									
	ORGANIZE			DIRECT		ALLOCATE		INFORM			REQUEST				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>COMMANDERS</b>															
1 FORCE	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
2 COMBAT SERVICE SUPPORT	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
3 ENGINEER	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
4 FIRE SUPPORT	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
5 INTELLIGENCE/ELECTRONIC WARFARE		*	*	*	*	*	*	*	*	*	*	*	*	*	
6 AIR DEFENSE ARTILLERY		*	*	*	*	*	*	*	*	*	*	*	*	*	
7 AIR-GROUND		*	*	*	*	*	*	*	*	*	*	*	*	*	
<b>STAFF</b>															
8 PERSONAL															
9 CHIEF OF STAFF						*				*	*				
10 LIAISON				*		*			*		*	*	*	*	
11 COORDINATING		*			*	*			*		*	*	*	*	
12 SPECIAL		*	*		*	*		*	*		*	*	*	*	
<b>FORCES</b>															
13 WEAPONS					*					*			*		
14 SUPPORT						*					*		*		
15 SENSORS							*				*	*		*	
16 SIGNAL			*					*			*				

STAFF  
COMMANDERS  
FORCES

Directory .2 Command and Control Item/Interactions

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 1
(1, -)	User Requirements/Issues - The Automated CORDIVEM will be used to support force structure trade-offs, new system acquisition, and changes in tactics, doctrine, and training. The trade-offs will be made in the total context of corps operations and incorporate the essential components of the various system interactions: the electronic battlefield (to include jamming, homing systems, intelligence gathering, communication, command and control), and new technology systems. New system acquisition will address direct measurement of how systems will influence total corps/division effectiveness. Tactics and doctrine issues include such items as second echelon interdiction, control of the separate brigade, nuclear employment, resource allocation, force organization, interface with theater and adjacent corps, intelligence collection, fusion, and dissemination. Specifically, the command decision process shall allow for representing accurately the principles of war. These simulation processes must be responsive to user needs. To this end, many of the functional requirements identified for the commander (particularly those associated with staff organization) shall be implemented in an automated preprocessing facility.	
(7, -)		
(8, -)	User Requirements/Issues - In addition to the commander's user requirements, the Automated CORDIVEM shall support command and control system studies which require detailed representation of headquarters, organization and operations, staff processing, and individual message handling.	
(12, -)		
(13, -)	User Requirements/Issues - The basic issue is to maximize the combat effectiveness of the force within various resource constraints. Various weapon mixes, air assault mixes, and variations of brigade/division organization, maintenance organizations, supply distributions, etc., need to be considered. Trade-offs need to be made among maneuver, combat support, and combat service support assets in terms of numbers of battalions, numbers of weapon systems, and amount/mix of intelligence systems. These trade-offs must be made in the total context of corps/division operations and incorporate the essential components of the various system interactions. Measurement of the combat effectiveness of such systems focuses on those aspects of the systems as they relate to the corps and divisions. That is, the representation of the system performance may be aggregated in terms of direct fire effects, but will provide direct measurement of corps/division related issues, e.g., supportability and how that influences total corps/division effectiveness.	
(16, -)		

TABLE 2.1 C2 COMMANDERS

ITEM	INTERACTION					LEVEL 2
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
<b>FORCE</b>						
1 CORPS	* * *	* * *	* * *	* * *	* *	
2 DIVISION	* * *	* * *	* * *	* * *	* *	
3 BRIGADE/REGIMENT	* * *	* * *	* * *	* * *	* *	
4 BATTALION	* * *	* * *	*	* * *	* *	
<b>COMBAT SERVICE SUPPORT</b>						
5 CORPS	* * *	* * *	*	* * *	* *	
6 DIVISION	* * *	* * *	*	* * *	* *	
7 BRIGADE	*	*	*	* * *	* *	
<b>ENGINEER</b>						
8 BATTALION	* * *	* * *	*	* * *	*	
9 COMPANY				* *	*	
<b>FIRE SUPPORT</b>						
10 CORPS	* * *	* * *	*	* * *	*	
11 DIVISION	* * *	* * *	*	* * *	*	
12 BATTALION	*	*	*	* * *	*	
<b>INTELLIGENCE/ELECTRONIC WARFARE</b>						
13 BRIGADE	* * *	* * *	*	* * *	* *	
14 BATTALION	*	*	*	* * *	*	
<b>AIR DEFENSE ARTILLERY</b>						
15 BRIGADE	* * *	* * *	*	* * *		
16 BATTALION	*	*	*	*		
<b>AIR-GROUND</b>						
17 BRIGADE AIR SUPPORT	* *	*	*	* * *	* *	
18 BRIGADE AIR ATTACK	* *	*	*	* * *	* *	
STAFF FORCES COMMANDERS						

Directory 2.1 C<sup>2</sup> Commanders

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(1, 1)	<p><u>Item:</u> Commanders  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> The commander discharges his responsibilities through an established chain of command. The commander alone is responsible for all that his unit does or fails to do. All orders from a higher commander to a subordinate unit are issued by the commander of the highest unit to the commander of the next subordinate unit; bypass of the chain occurs only in urgent situations. The superior also delegates the necessary authority to the subordinate to accomplish the mission. Having delegated the authority, he must provide the necessary guidance, resources, and support needed to accomplish the mission.</p>	
(1, 2)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> The command and control system encompasses the personnel, equipment, communications, facilities, and procedures necessary to gather and analyze information, to plan for what is to be done, and to supervise the execution of operations. The tasks of the commander are accomplished through a C<sup>2</sup> system consisting of three interrelated components as follows:</p> <p>1) A C<sup>2</sup> Organization</p> <p>The organization of the HQ for operations. This is how the commander has organized his staff to accomplish the mission. Included in the commander's organization are the roles and relationships of the staff, the authority and responsibilities of the staff, and the functional grouping of staff sections. The specific responsibilities and duties of a particular staff officer will vary depending on the level and type of organization, mission to be performed, and the personal desires of the commander. Activities of the staff focus on the purpose of the staff, to assist the commander. They center on five common functions: providing information, making estimates, making recommendations, preparing plans and orders, and supervising the execution of decisions. Staff responsibility, authority, duties, and activities are based on specific organizational considerations and principles.</p> <p>Staff officers are assigned functional areas of interest and responsibility for accomplishing staff actions within those areas. The assignment of staff responsibilities carries no connotation of command authority over other</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>staff officers or over any other elements of the command. The commander specifically delegates authority to the staff or to a particular staff officer; formal notification of such delegation is disseminated.</p> <p>Considerations in staff organization include missions and broad fields of interest. The mission determines the activities that must be accomplished. These activities in turn determine how the staff must be organized to accomplish the mission. Regardless of the command mission, staff operations can be divided into five broad fields: personnel, intelligence, operations and training, logistics, and civil-military operations. The commander establishes an effective staff organization by:</p> <ul style="list-style-type: none"> <li>(a) Describing assigned responsibilities clearly.</li> <li>(b) Delegating decision-making authority to staff officers commensurate with their assigned responsibility.</li> <li>(c) Grouping related activities.</li> <li>(d) Establishing an effective span of control.</li> </ul> <p style="margin-left: 2em;">(1) Organization</p> <ul style="list-style-type: none"> <li>o This section describes the general organization of headquarters for the conduct of combat operations. Detailed information that applies to specific organization levels is contained in the following field manuals:</li> </ul> <p style="margin-left: 2em;">FM 60-20-2, Division Artillery, Field Artillery Brigade, and Field Artillery Section (Corps)</p> <p style="margin-left: 2em;">FM 7-30, Infantry, Airborne, and Air Assault Operations</p> <p style="margin-left: 2em;">FM 17-19, Cavalry</p> <p style="margin-left: 2em;">FM 71-2, The Tank and Mechanized Infantry Battalion Task Force</p> <p style="margin-left: 2em;">FM 71-3, Armored and Mechanized Brigade Operations</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	FM 71-100, Armored and Mechanized Division Operations	
	FM 71-101, Infantry, Airborne and Air Assault Division Operations	
	FM 100-15, Corps Operations	
	<ul style="list-style-type: none"> <li>o The organization of a headquarters for combat operations is designed to facilitate the command and control process. It includes consideration of the physical means of accomplishing the mission - the communications, control centers, information-gathering systems, and the staffs, facilities, and equipment necessary to gather and analyze information, plan, and supervise execution.</li> <li>o The commander determines the location, composition, and organization of the headquarters according to the requirements of the mission and the tactical situation.</li> </ul>	
(b)	Organizational Considerations	
	<p>(1) The organization of a headquarters for combat operations is usually accomplished by grouping staff sections, or elements of the sections, by function to promote efficiency and staff coordination. This process may include dividing or echeloning the headquarters into separate command and control elements such as a tactical command post, main command post, and rear command post.</p> <p>(2) Command posts (CPs) and their supporting automation and communications systems are high-priority targets. They present radio frequency, thermal, acoustic, visual, and moving target signatures that are relatively easy to detect even by an unsophisticated enemy. Unless their vulnerability is reduced, it can be assumed that they will be targeted for destruction or, as a minimum, subjected to disruption by electronic means. Actions taken to provide for the</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>survivability of command posts include such techniques as locating them out of the range of enemy mortar or artillery systems, dispersion, deception, hardening, and frequent displacement. Under most circumstances, survivability requires that a combination of techniques be employed. Survivability measures must also be balanced against the requirement for retaining effectiveness.</p> <p>(3) The following are some considerations that affect the organization of the headquarters for combat operations:</p> <ul style="list-style-type: none"> <li>o Missions, tasks, and resources must be in reasonable balance. The commander considers what must be done to accomplish the current mission and organizes and allocates sufficient resources to each element.</li> <li>o Functional responsibilities and authority must be clearly established. When the command and control facility is echeloned, the authority of each echelon must be clearly defined in the standing operation procedures (SOPs).</li> <li>o Because large command posts are vulnerable to detection, survivability must be enhanced by echeloning command post elements on a functional basis and/or dispersing elements within command posts.</li> <li>o Communications with adjacent, subordinate, and higher headquarters and the ability to maintain communications during displacements must be provided for. Echeloning command and control elements depends on good continuous communications. The communications-electronics (C-E) officer must be included in the early stages of planning for command post locations to insure successful command and control.</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	(4) Organization for Planning	
	There are four fundamental methods or organizing the staff for planning:	
	<ul style="list-style-type: none"> <li>o Use the existing organization without change.</li> <li>o Create a permanent planning section or subsection.</li> <li>o Use a temporary planning committee.</li> <li>o Use a combination of the above methods.</li> </ul>	
(c)	Command Posts	
	(1) General	
	<ul style="list-style-type: none"> <li>o The command post (CP) is the principal facility employed by the commander for command and control of combat operations. A command post consists of those coordinating and special staff activities and representatives from supporting Army elements and other Services that are necessary to carry out operations.</li> <li>o The corps and division headquarters are particularly adaptable to organization by echelon into tactical, main, and rear command posts. At brigade and battalion levels, a main command post and a rear element located with the unit trains are a common occurrence. Personnel and equipment limitations normally preclude operation of separate tactical and main command posts on a full-time basis below division. Supporting commands do not normally echelon their headquarters.</li> <li>o An alternate command post may be organized or designated in order to insure continuity of operation during displacements or in the case of serious damage to a command post facility. The alternate command post may be a subordinate</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>headquarters. Provisions for alternate command posts are normally established in SOPs.</p> <ul style="list-style-type: none"> <li>o Commanders frequently leave their command posts to be present at an important action. When this happens, they may be accompanied by a small party called a command group. A command group is organized and equipped to suit the commander.</li> </ul> <p>(2) Tactical Command Post (Tactical CP)</p> <ul style="list-style-type: none"> <li>o The tactical CP, when established, is the forward echelon of the headquarters. The tactical CP generally consists of G2, G3, fire support, tactical air control party (TACP), air defense artillery, and combat service support liaison (G1, G4) elements. It is located well forward on the battlefield so that the commander is in proximity to subordinate commanders and can directly influence operations. At division, the tactical CP is located within FM radio range of the committed brigades.</li> <li>o The tactical CP is limited in physical size and electronic signature and is capable of being displaced rapidly and frequently.</li> </ul> <p>(3) Main Command Post (Main CP)</p> <ul style="list-style-type: none"> <li>o The main CP normally operates under the control of the chief of staff. The main CP consists of those staff activities involved in sustaining current operations and in planning future operations. The focal point for these operations is the tactical operations center (TOC). In addition to the chief of staff, the main CP consists of G1, G2, G3, and G4 elements; fire support and chemical elements, a tactical air control party (TACP) element, and an airspace management element (AME) consisting of air defense artillery and</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>Army aviation staff elements. The main CP also exercises command and control of the current operation in cases where a tactical CP is not employed.</p> <ul style="list-style-type: none"> <li>o The location of the main CP is well to the rear.</li> </ul>	
	<p>(4) Rear Command Post</p> <ul style="list-style-type: none"> <li>o The rear echelon consists of those staff activities concerned primarily with combat service support of the force, administrative support of the headquarters, and other activities not immediately concerned with current operations.</li> <li>o Because of their functions, rear echelons will normally be near or collocated with combat service support units (e.g., division support command). A corps rear echelon may be located near the corps support command (COSCOM) command post.</li> </ul>	
2) A C <sup>2</sup> Process	<p>The decision making process and procedures used by the HQs. Included are the reports, records, reporting systems, briefings, and other procedures which support the decision making process.</p> <p>(a) General</p> <p>(1) This section describes the staff elements and activities normally associated with command posts. The number and type of functions performed in a particular command post on a recurring basis determine the number of elements and personnel within those elements.</p> <p>(2) The criteria used to determine essential functions and staff elements needed in the command post are:</p> <ul style="list-style-type: none"> <li>o The contribution that each function makes to operations.</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"> <li>o The extent to which accomplishment of each function depends on coordination with other functions.</li> </ul> <p>(3) Considerations in developing an optimum command post organization are improved communications and the enhanced ability to obtain information rapidly and to react promptly.</p> <p>(b) G1 Section</p> <p>(1) G1 activities are conducted at the main and rear echelons of the command post.</p> <p>(c) G2 Section</p> <p>(1) The majority of the G2 section is located at the main CP. These personnel process all intelligence information and are the focal point for the integration of intelligence from all sources. A small G2 element is located at the tactical CP to provide the commander and G3 the intelligence on which to base current tactical decisions.</p> <p>(2) Functions performed at the main CP are planning, collection, management, analysis, production, and dissemination of intelligence. The G2 reconnaissance and surveillance (R&amp;S) element plans and coordinates both air and ground reconnaissance and surveillance activities and provides information and intelligence collected through its means.</p> <p>(d) G3 Section</p> <p>(1) The functions of the G3 section are divided between control of combat operations and sustaining the battle. The combat operations functions are carried on at the tactical CP, while sustaining functions are conducted at the main CP.</p> <p>(2) The functions performed by the G3 element at the tactical CP include supervising the execution of operations, maintaining the current</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>friendly situation and unit status, maintaining a current operations estimate, providing the maneuver portion and supervising preparation of fragmentary operation orders, and recommending allocation of additional resources.</p> <p>(3) The G3 element at the main CP monitors combat operations and coordinates available combat support. Specific functions performed by the element are the preparation of operation plans; receipt, processing, and approval of preplanned close air support requests; coordination of tactical troop movements; maintenance of troop lists; recommendations for the employment of nuclear and chemical weapons; conduct of electronic warfare; and preparation of reports to higher headquarters.</p>	
(e)	G4 Section	
	<p>(1) The G4 section is divided between the main and rear CPs. The section may also furnish a representative to the tactical CP to ensure that the commander and staff are advised of the logistic situation and the G4 current on the battle situation and changing priorities.</p> <p>(2) The element at the main CP is primarily concerned with coordinating the logistical aspects with the tactical aspects of the battle. The element located in the rear echelon has the responsibility for planning and supervising the supply, services, maintenance, and transportation activity required to support the command.</p>	
(f)	G5 Section	
	<p>This section is normally located in the rear echelon of the command post. G5 functions include those actions that embrace the relationship between the command, civil authorities, and the people in the area of operations.</p>	
(g)	Tactical Operations Center Support Element	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>The tactical operations center support element supports the intelligence, electronic warfare, and operations security (OPSEC) functions of the G2 and G3. At Corps, this element is provided by the operations battalion of the Corps Military Intelligence group. At division, the tactical operations center support element is provided by the organic Military Intelligence battalion. It has a collection management and dissemination section, an all-source production section, an electronic warfare section, an OPSEC management and analysis section, a USAF weather section, a tactical command post section, and a headquarters section. At Corps, this element also has an imagery interpretation section.</p> <p>(1) Collection Management and Dissemination Section</p> <p>Operating under the staff supervision of the G2, this section:</p> <ul style="list-style-type: none"> <li>o Provides direction and control of intelligence and electronic warfare operations based on requirements identified by the G2 (intelligence, counterintelligence, and electronic warfare support measures) and the G3 (electronic warfare countermeasures and OPSEC).</li> <li>o Prepares the collection plan based on G2 and G3 requirements, requirements of higher headquarters, and requests from adjacent and subordinate units and, as required, forwards requests to higher and adjacent headquarters.</li> <li>o Issues mission taskings to organic and supporting MI units and passes taskings for other units to the G3 section for coordination and tasking through G3 channels.</li> <li>o Disseminates intelligence and combat information to all who need it, to include the tactical CP section, when deployed, and</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>the Fire Support Element (FSE) for immediate exchange of target information.</p> <p>(2) The All-source Production Section</p> <p>Operating under the staff supervision of the G2, this section:</p> <ul style="list-style-type: none"> <li>o Analyzes, processes, correlates, and integrates information from all sources into products necessary to meet the commander's requirements.</li> <li>o Develops and maintains an extensive intelligence data base, to include data on enemy intelligence collection capabilities, enemy air defense, and electronic order of battle (EOB).</li> <li>o Identifies gaps in the intelligence effort and provides the collection management and dissemination section feedback for adjustments to the collection plan.</li> <li>o Maintains an analyst intelligence situation map and target folders essential for target development.</li> <li>o Receives national intelligence products and sensitive compartmented information (SCI) data from the special security office (SSO).</li> <li>o Works with technical analysts at the MI battalion to clarify, verify, and evaluate signal intelligence (SIGINT) products.</li> <li>o Performs intelligence preparation of the battlefield (IPB) in coordination with the Staff Weather Officer (SWO) and supporting engineer terrain team.</li> <li>o Assists the G2 in preparing the intelligence estimate and maintaining a continuous estimate of the enemy situation.</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>(3) Electronic Warfare Section</p> <p>Operating under the staff supervision of the G3, this section:</p> <ul style="list-style-type: none"> <li>o Provides direction of electronic warfare (EW) operations.</li> <li>o Plans for the allocation of organic and supporting EW elements to meet requirements.</li> <li>o Passes requirements to the collection management and dissemination section as missions to be tasked to the MI battalion. Target acquisition requirements for jamming operations are identified as collection requirements and passed to subordinate units by the collection management and dissemination section and/or G3.</li> <li>o Evaluates the vulnerability of enemy emitters to electronic countermeasures (ECM).</li> <li>o Recommends enemy targets for ECM to support planned and current operations.</li> <li>o Recommends the priority of effort for jamming by general support assets.</li> <li>o Prepares the EW portions of estimates, plans, and orders.</li> <li>o Coordinates requirements for ESM to support ECM.</li> <li>o Coordinates jamming on-off controls for planned and ongoing jamming operations.</li> <li>o Assists the G3 in evaluating effectiveness of EW operations and recommends changes to the task organization.</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"> <li>o Evaluates enemy EW efforts and recommends appropriate electronic counter-countermeasures (ECCM).</li> </ul>	
	<p>(4) Operations Security Management and Analysis Section</p> <p>Operating under the staff supervision of the G3, this section:</p> <ul style="list-style-type: none"> <li>o Performs mission management for OPSEC.</li> <li>o Plans OPSEC measures.</li> <li>o Prepares the OPSEC estimate and OPSEC portions of plans and orders.</li> <li>o Compares enemy information provided by the all-source production section with command signatures and profiles to identify vulnerabilities and opportunities for deception.</li> <li>o Develops OPSEC support missions based on enemy capabilities, operational objectives, operational risks, deception planning, and G3 guidance, to provide indicators of planned or ongoing operations to the enemy.</li> <li>o Passes OPSEC support missions to the collection management and dissemination section for tasking of MI assets.</li> <li>o Assists the G3 with deception planning, and monitoring and analyzing the effect of deception operations.</li> </ul>	
	<p>(5) Tactical Command Post Section</p> <p>This section operates under the supervision of the G2 or assistant G2. It provides intelligence support to the tactical command post through interface with the collection management and dissemination section.</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	(6) Intelligence and electronic warfare (IEW) support to the brigade is provided by an IEW support element from the division MI battalion. This element coordinates operations in support of the brigade, passes missions to the collection and jamming platoon supporting the brigade and disseminates information to the brigade staff, subordinate battalions, and supporting field artillery units.	
(h)	<b>Fire Support Element (FSE)</b>	
	(1) The FSE is responsible for planning and coordinating fire support. At Corps, the FSE is staffed by personnel from the field artillery section of the Corps headquarters and headquarters company. At division, the FSE is provided by division artillery. Division artillery also furnishes an FSE to each maneuver brigade and battalion. Major functions of the FSE are:	
	<ul style="list-style-type: none"> <li>o Advising on all fire support matters.</li> <li>o Developing the fire support plan and coordinating its implementation, to include nuclear and chemical fires.</li> <li>o Maintaining a current status of all fire support means available to the force, to include field artillery, air support, and naval gunfire.</li> <li>o Planning and coordinating fire support suppression of enemy air defenses (SEAD).</li> <li>o Recommending field artillery organization for combat.</li> <li>o Recommending target priorities for fire support.</li> </ul>	
	(2) At Corps and division, the main command post and tactical command post will both have an FSE. Activities at the tactical command post focus on monitoring the current fire support situation to ensure that fire support is	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>properly allocated, assessing the need for additional fire support, advising the commander on adequacy of fire support for the operation being conducted, maintaining the status of fire support means, and expediting immediate fire support needs. The role of the main command post FSE is to respond to the immediate fire support needs of the tactical command post FSE, to plan fire support for future operations, to respond to requests for additional fire support from subordinate commands, to develop the nuclear package (Corps) and subpackage (Division), develop, in coordination with other fire support representatives, fire support plans and disseminate them through the G3 section, to plan SEAD fires for both current and future operations, and to develop options and recommend field artillery organization for combat, target priorities, and fire support coordination measures.</p>	
(i)	<p>Airspace Management Element (AME)</p> <p>(1) The AME is responsible for determining how the commander's airspace needs can best be met. The AME at corps (designated CAME) and division (designated DAME) is a formal activity staffed by air defense and Army aviation staff representatives and a liaison officer from the supporting air traffic control (ATC) unit. The AME operates under the staff supervision of the G3 and is collocated with the FSE and TACP in the TOC. When a tactical CP is employed, a representative of the AME will normally deploy with it. At brigade and battalion level, a formal AME is not established and airspace management functions are performed by the S3 Air assisted by supporting liaison personnel (e.g., Air defense artillery liaison officer, fire support officer, air liaison officer).</p> <p>(2) The primary purpose of the AME is to coordinate all airspace management functions among Army airspace users and with other Services. The AME also maintains the current</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>status of air defense artillery and Army aviation resources available to or supporting the command.</p> <p>(3) Major functions of the AME are:</p> <ul style="list-style-type: none"> <li>o Identifying and resolving potential conflicts concerning the use of airspace through the correlation of airspace management information.</li> <li>o Developing and maintaining the airspace utilization map.</li> <li>o Developing, maintaining, and disseminating recommended low-level transit routes (LLTR).</li> <li>o Maintaining and disseminating information on all restricted operations areas (ROA), standard-use Army air routes, weapons-free zones, preplanned field artillery fires, airmobile operations, major aviation operations, and forward area rearm/refuel point (FARRP) locations.</li> <li>o Relaying information concerning air defense warnings; rules of engagement (weapons control status, hostile criteria).</li> <li>o Monitoring the status of air defense and aviation assets.</li> <li>o Disseminating information concerning enemy air defense activity.</li> <li>o Providing airspace management information relevant to development of air-movement plans, and ensuring that airlift requirements are included in airspace management annexes.</li> <li>o Coordinating and disseminating to the ATC and ADA procedures to be used by aviation units for across forward line of own troops (FLOT) operations to include return procedures.</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"> <li>o Disseminating to flight operation centers (FOC), flight coordination centers (FCC), and aviation units any grid matrix systems to be used to facilitate early warning and short-range air defense (SHORAD) control.</li> <li>o The AME will also provide the following information as a minimum, to the FOC/FCC: <ul style="list-style-type: none"> <li>o Low-level transit routes and standard-use Army air routes.</li> <li>o Restricted areas, weapons free zones, air defense weapons control status, and rules of engagement.</li> <li>o Field artillery and ADA fire unit location.</li> <li>o Air defense, Army aviation, and airspace management annexes to operation plans and orders.</li> </ul> </li> </ul>	
	<p>(4) The corps airspace management element (CAME) is the principal interface for airspace management between the Army and the airspace control authority. The point of this interface is the Air Support Operations Center (ASOC). The relationship between the CAME and ASOC consists of exchanging information on the use of airspace. The ASOC advises the CAME about Air Force activities that affect corps operations and the CAME advises the ASOC on corps activities that affect Air Force operations. Typical products of this coordination are low-level transit routes (LLTR) and minimum risk routes (MRR).</p>	
	<p>(j) Air Support Operations Center (ASOC)</p> <p>The ASOC is an Air Force element that provides the focal point for joint AirLand operations at Corps. The ASOC may be collocated with the CTOC or separated from it. The ASOC is primarily concerned with the exchange of combat data between air and ground forces</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>concerning the planning, coordination, and execution of tactical air support of ground operations. It also provides fast reaction to immediate requests for offensive air support.</p> <p>(k) Tactical Air Control Party (TACP)</p> <p>(1) A US Air Force TACP is normally provided to each maneuver command from corps through battalion level. The TACP advises and assists the commander, requests and coordinates tactical air support. Support provided encompasses fighter, reconnaissance, and airlift (airlift support is not provided below brigade level) operations.</p> <p>(2) The TACP supporting the Corps is directly subordinate to the ASOC and may be collocated with it. The senior member of each TACP is the air liaison officer (ALO) to the supported command. Except as previously noted, the TACP is normally collocated with the FSE and AME.</p> <p>(3) Major functions of the TACP are:</p> <ul style="list-style-type: none"> <li>o Assisting in planning and requesting tactical air support, to include close air support, battlefield air interdiction, reconnaissance, and airlift.</li> <li>o Advising on tactical air support employment, and resources, to include capabilities and limitations.</li> <li>o Preparing, reviewing, and forwarding immediate tactical air support requests to the ASOC.</li> <li>o Assisting in preparing portions of plans and order dealing with tactical air support, to include the air support appendix of the fire support annex.</li> <li>o Coordinating the integration of other fire support means with air missions to include requesting suppression of enemy air defenses (SEAD) support.</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>(1) Nuclear, Biological, and Chemical Element (NBCE)</p> <p>The NBCE is established at Corps and division headquarters with resources from the chemical section and an attached JA Team (TOE 3-500). The NBCE assists in the control, coordination and supervision of nuclear, biological, and chemical operations.</p> <p>Major functions of the NBCE are:</p> <ul style="list-style-type: none"> <li>o Receiving, processing, evaluating, and disseminating nuclear, biological, and chemical monitoring and survey data.</li> <li>o Preparing detailed fallout predictions for enemy nuclear weapons.</li> <li>o Preparing chemical vapor hazard predictions for enemy chemical attacks.</li> <li>o Planning, controlling, and coordinating nuclear, biological, and chemical monitoring and surveys.</li> <li>o Preparing and disseminating warning messages for friendly chemical strikes.</li> <li>o Collation, evaluation, and distribution of NBC contamination data.</li> <li>o Collection of NBC contamination information in conjunction with higher, lower, and adjacent units.</li> <li>o Assisting in planning the use of nuclear and chemical weapons.</li> <li>o Planning and supervising chemical target analysis.</li> <li>o Planning and recommending requirements for the use of the NBC defense company and other attached chemical units.</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"><li>o Preparing the NBC defense annex to plans and orders.</li><li>o Receipt, collation, evaluation, preparation and distribution of NBC reports.</li><li>o Effective wind-message preparation and dissemination.</li><li>o Maintaining the NBC situation map and overlays.</li><li>o Planning and supervising measures to avoid or reduce effects of enemy NBC attacks.</li><li>o Advising on the impact of NBC contamination on tactical and logistical operations.</li><li>o Advising the G2 on NBC intelligence matters.</li><li>o Advising on smoke operations in coordination with the G3.</li><li>o Advising on the implementation of MOPP.</li></ul> <p>(m) Other Staff Elements</p> <p>Communications-Electronics and Engineer staff representatives will normally be located at the main command post.</p> <p>(n) Rear Area Operations Center (RAOC)</p> <p>A RAOC is a table of organization and equipment (TOE) organization assigned to each corps. Its mission is to plan, coordinate, advise, monitor, and direct the execution of the corps rear area protection (RAP) response.</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	3) C <sup>2</sup> Facilities	
	Command posts and supporting automation and communication systems.	
(1, 3)	<p><u>Item:</u> Forces  <u>Mechanism:</u> M6, M9  <u>Factors:</u> F14, F15</p> <p><u>Representations:</u> Command responsibility and authority are normally established through one of six standard relationships:</p> <ol style="list-style-type: none"> <li>1) Organic</li> </ol> <p>A unit that forms an essential part of a U.S. Army unit and is listed in its Table of Organization and Equipment (TOE).</p> <ol style="list-style-type: none"> <li>2) Assigned</li> </ol> <p>A unit that is placed in an organization on a relatively permanent basis and is controlled and administered for its primary function or the greater portion of its functions by the organization to which it is assigned.</p> <ol style="list-style-type: none"> <li>3) Attached</li> </ol> <p>A unit that is placed in an organization on a relatively temporary basis. Subject to explicit limitations, the commander to which the unit is attached exercises the same degree of C<sup>2</sup> over the attached unit.</p> <ol style="list-style-type: none"> <li>4) Operational Control (OPCON)</li> </ol> <p>A unit that has been provided to another commander to accomplish a specific mission or tasks which are usually limited by function, time, or location. It does not include administrative or logistical responsibility for the unit.</p> <ol style="list-style-type: none"> <li>5) Operational Command</li> </ol> <p>Synonymous with OPOON.</p> <ol style="list-style-type: none"> <li>6) Support</li> </ol> <p>A unit that aids, protects, complements, or sustains another unit. It remains under the command of its parent</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>headquarters; however, the supporting unit is authorized and required, within the limits of the directive establishing the relationship, to respond directly to the supported unit's request for support.</p>	
(1, 4)	<p><u>Item:</u> Commanders  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> Command is the authority that a commander in the military service lawfully exercises over subordinates by virtue of rank or assignment. Normally, all orders from a higher HQ requiring or prescribing action by a subordinate unit of the command are issued by authority of the higher commander. Plans and orders express the commander's decision and concept. The procedure for planning, coordinating, and issuing orders invariably requires some compromise between the necessity for speed and responsiveness and the need for orderly procedure and detailed planning. Several types of orders are associated with or derived from the C<sup>2</sup> planning process.</p>	
(1, 5)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> Guidance, direction, and information normally go from the commander through the Chief of Staff. A major portion of command direction of the staff centers on supporting the decision-making process.</p> <p>1) Introduction</p> <p>(a) The commander and staff continually face situations that involve uncertainties, questionable or incomplete data, and several possible alternatives. They must not only decide what to do but also recognize when a decision is necessary. A systematic approach to problem solving assists in applying thoroughness, clarity, judgment, logic, and professional knowledge to the task.</p> <p>(b) Solutions to problems result from a logical and orderly process that consists of:</p> <p>(1) Recognizing and defining the problem.</p> <p>(2) Gathering the facts and making assumptions needed to determine the scope of and the solution to the problem.</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"> <li>(3) Developing possible solutions to the problem.</li> <li>(4) Analyzing and comparing possible solutions.</li> <li>(5) Selecting the best solution to the problem.</li> </ul>	
	<ul style="list-style-type: none"> <li>(c) The military decision making process is used by the commander and staff to arrive at and execute tactical decisions. It is a continuous process. Although some actions ordinarily occur sequentially, others take place concurrently. Time available, urgency of the situation, and the judgment of the commander all affect the application of this logical approach to decision making.</li> </ul>	
	<ul style="list-style-type: none"> <li>(d) Often, time becomes the most critical factor facing the commander and staff in the decision making process. When time does not allow formal adherence to procedure, the commander must take action to insure timely decisions.</li> </ul>	
2)	<p>The Estimate of the Situation</p> <ul style="list-style-type: none"> <li>(a) The purpose of the estimate of the situation is to collect and analyze relevant information for developing, within the limits imposed by the information and time available, the most effective solution to a problem.</li> <li>(b) The estimate of the situation is applicable to any situation and any level or type of command.</li> <li>(c) The estimate is as thorough as time and circumstances permit. The detail varies with the level and type of command. Information, conclusions, and recommendations from other pertinent estimates may be used.</li> <li>(d) The estimate of the situation is a continuous process for the commander and staff. Estimates are revised continuously as factors that affect operations change, as new facts are recognized, as assumptions are replaced by facts or rendered invalid, or as changes to the mission are received or indicated.</li> </ul>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	3) The Commander's Estimate	
	(a) The commander's estimate results in a decision on how to accomplish a given mission. It is through consideration of the mission, enemy, terrain and weather, troops available, and time (METT-T) and other relevant factors. The commander's estimate is based on personal knowledge of the situation and on staff estimates.	
	(b) Commanders of combat support and combat service support units conduct estimates in support of operations to determine the supportability of tactical courses of action and the best course of action for executing their specific mission.	
	(c) Based on the commander's personal knowledge of the situation and on staff conclusions and recommendations reached in their estimates, the commander's estimate is completed. During this process, the commander formulates, analyzes, and compares alternative courses of action that are tentatively considered feasible. A course of action is defined as feasible if it will accomplish the mission and can be supported with available resources.	
	(d) Having decided on a course of action to accomplish the mission, the commander announces his decision and concept to key members of the staff.	
	4) Mission Analysis	
	The mission is assigned by higher headquarters or is developed or deduced by the commander. The commander either initiates mission analysis at this point or requires, requests, or develops additional information.	
	(a) Mission analysis is the means through which the commander obtains an understanding of the mission. It involves identifying:	
	(1) The tasks that must be performed.	
	(2) The purpose to be achieved through accomplishing the assigned tasks.	
	(3) Constraints on the units' actions.	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>(b) Some tasks are specified in the operation plan or order as received from higher headquarters. Other tasks may be implied by the situation, mission, and purpose of the operation and must be deduced by the commander during the analysis.</p> <p>(c) Understanding the purpose to be achieved through accomplishing the tasks is important for two reasons. First, insight is obtained as to the intentions of the superior commander. Secondly, it assists the commander in formulating courses of action by providing a means to determine their feasibility and whether or not they will accomplish the mission.</p> <p>(d) Constraints are limitations placed on the command. They impose, in one way or another, on the freedom of action of the command as to the operation to be conducted and/or the planning process.</p>	
(1, 6)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> Tasks are assigned to specific units in keeping with the SOP, warning order, admin/log order, operations order, or fragmentary order in effect for those units.</p>	
(1, 7)	<p><u>Item:</u> Commanders  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> Commanders are apportioned to command elements, i.e., corps, divisions, brigades, regiments, battalions, groups, squadrons, and any special commands.</p>	
(1, 8)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> Available personnel are apportioned to identified staff elements by unit commanders.</p>	
(1, 9)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> Available personnel are apportioned to identified staff elements by unit commander to support the mission as stated in the current or future OPLAN.</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(1, 10)	<p><u>Item:</u> Commanders  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> The direct, official link between HQs through which all orders and instructions to subordinates are passed is the command channel. Command channels are from commander to commander. Within granted authority, staff officers use command channels.</p>	
(1, 11)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> The commander and staff exchange information about the mission and the staff provides the commander with information about the current situation that is needed to conduct or complete mission analysis. Guidance, direction, and information normally go from the commander through the Chief of Staff.</p> <p>1) Planning guidance is provided by the commander to the staff as often as required. The frequency, amount, and content of planning guidance will vary with the mission, time available, situation, information available, and experience of the commander and staff.</p> <p>2) The restated mission results from the commander's mission analysis. It is a clear, concise statement of the task (or tasks) to be accomplished by the command and the purpose to be achieved. When there are multiple tasks, they normally are described in the sequence in which they are to be accomplished. The restated mission becomes the basis of all commander and staff estimates and is paragraph 1 of those estimates.</p> <p>3) Feedback of information is received through reports and personal observations by the commander, the staff, or subordinate commanders and staff. This information is used to evaluate whether the mission is being accomplished. Necessary changes to previous instructions can be made with fragmentary orders while an operation is in progress. Feedback helps eliminate uncertainty and in some cases presents information not previously available, allowing better decisions to be made. As the situation changes, additional decisions are required and the process is repeated.</p>	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(1, 12)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> The lowest level C <sup>2</sup> commanders provide operational data to force elements.	
(1, 13)	<u>Item:</u> Commanders <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Subordinate commanders request changes in mission, additional resources, and combat support from higher commanders.	
(1 14)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Requests for intelligence information, additional resources, and operational information are made by subordinate commanders to higher echelons and supporting staff. Commanders establish essential elements of information (EEI) and other information requirements (OIR).	
(2, -)	See (1, -) above.	
(3, -)	See (1, -) above for general functions.	
(4, -)	See (1, -) above for general functions.	
(5, -)	The OOSCOM commander is a major subordinate commander to the corps commanding general as are the division commanders. He provides CSS support to all corps elements in support of tactical operations. In performing his mission, he relieves the corps commander and staff of detailed planning and operational responsibilities in CSS. Thus, the corps commander and his staff can concentrate on the tactical mission and on long-term planning. The OOSCOM commanding general, assisted by his staff, commands and controls his subordinate units in all their activities.	
(6, -)	See (5, -) above for general functions.	
(7, -)	See (5, -) above for general functions.	
(8, -)	Engineer commands, brigades, and groups are organized and tailored for long-term operations. Specific shorter term operations may require that the system of command and control	

Directory 2.1 C<sup>2</sup> Commanders (Continued)

<u>(ITEM, INTERACTION)</u>	<u>LEVEL 2</u>
<u>DESCRIPTION</u>	
	be temporarily changed. Organizations are tailored for short term operations through attachment or operational control.
(9, -)	See (8, -) above.
(10, -)	See Table 2.2.5, Item (1, -).
(11, -)	See Table 2.2.5, Item (10, -).
(13, -)	While both the corps and division have electronic combat assets, it is the division commander and his staff who exercise the key role in the EW battle. Many of the corps EW and intelligence assets are normally allocated to the on-line divisions. Because of its proximity to the enemy and its inherent combat power, the division becomes the focal point for electronic combat on the battlefield. The division commander establishes EW target priorities in accordance with their threat to his command and the target's vulnerability. Assets are provided by the CEWI elements at corps and division.
(14, -)	See (13, -) above.
(15, -)	AD units are under the operational control of the theater AD commander. The relationship between the ADA unit commander and the supported unit commander is determined by the tactical mission assigned the ADA unit.
(16, -)	See (15, -) above.
(17, -)	The cavalry brigade, air attack commander commands, controls, and communicates with the brigades subordinate units in support of air mobile and aerial logistic operations, reconnaissance, aerial observation, etc.
(18, -)	The cavalry brigade, air attack commander commands, controls and communicates with the brigades subordinate units in support of the maneuver unit find, fix, and destroy enemy armored and mechanized forces.

TABLE 2.1.1 C2 FORCE COMMANDERS

ITEM	INTERACTION					LEVEL 3				
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	10	11	12	13	14
CORPS	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15					
1 CORPS CMDR	* * *	* * *	* * *	* * *	*					
DIVISION										
2 DIVISION CMDR	* * *	* * *	* * *	* * *	*					
BRIGADE/REGIMENT										
3 CORPS AVN BDE CMDR	* * *	* * *	* * *	* * *	*					
4 CORPS ARMORED CAV REG CMDR	* * *	* * *	* * *	* * *	*					
5 BRIGADE CMDR	* * *	* * *	* * *	* * *	*					
BATTALION										

STAFF  
COMMANDERS  
FORCES

TABLE 2.1.2 COMBAT SERVICE SUPPORT COMMANDERS

ITEM	INTERACTION					LEVEL 3				
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	10	11	12	13	14
CORPS	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15					
	* * *	* * *	* * *	* * *	*					
DIVISION										
	* * *	* * *	* * *	* * *	*					
BRIGADE										

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Directory 2.1.1 C<sup>2</sup> Force Commanders

<u>(ITEM, INTERACTION)</u>	<u>LEVEL 3</u>
<u>DESCRIPTION (See note at end of Directory.)</u>	
(1, -)	Corps command includes the authority and responsibility for effectively using available resources and for planning, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions. The corps is concerned with combat, combat support, and combat service support functions. Primary emphasis is on planning and coordinating combat and combat support operations, and supervising combat service support operations being conducted by the corps support command. The organization of the coordinating staff group parallels the five broad fields of interest. The tactical orientation of the corps is indicated by separate intelligence and operations sections. Coordinating staff officers are designated.
(2, -)	Division command includes the authority and responsibility for effectively using available resources and for planning, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions. The division is concerned with combat, combat support, and combat service support functions. Primary emphasis is placed on planning and supervising the execution of tactical operations. Coordinating staff officers are designated in the same manner as at corps. The special staff group has a number of members who are both staff officers and subordinate unit commanders. Division and brigade commanders are concerned about an area of influence where they need to see and fight and an area of interest where they seek and receive information about the enemy. Determination of these two areas is based on the factors of mission, enemy, weather and terrain, troops and time available (METT-T). The commander defines the mission, designs the concept of operation, assigns missions and support to his subordinate commanders and determines where the main effort will be made and who will be responsible for it. Although the scope of the AirLand Battle varies at each echelon, the relative need for information from the depth and width of the operational area, and the synchronization of various arms and services in both the division and the brigade makes the decision as to where to place command posts, commanders, and principal staff officers and important tactical consideration.
(3, -)	See (2, -) above. Tactical unit commanders depend on their higher operational level commander to move them effectively into and out of battles and engagements. Successes and failures at the tactical level, when viewed as a whole by the operational level commander, are the basis for a wider scheme of maneuver. Small unit actions stimulate the operational level commander's anticipation for opportunities for relative positional advantage

Directory 2.1.1 C<sup>2</sup> Force Commanders

(ITEM, INTERACTION)	DESCRIPTION (See note at end of Directory.)	LEVEL 3
	which will defeat the enemy and result in victory. The perspective of the tactical commander is somewhat more objective; his concern is the destruction of the capability of enemy forces in his zone of action and his own force's survival. He concentrates on executing his portion of the overall mission effectively.	
(4, -)	See (3, -) above.	
(5, -)	See (3, -) above.	

NOTE: The general descriptions of force commanders by echelon given above must be combined with the functional properties of the command functions provided in Table 2.1 and Directory 2.1. Such a process will particularize the command processes to be represented at each echelon for each type of mission.

Directory 2.1.2 Combat Service Support Commanders

(ITEM, INTERACTION)	DESCRIPTION <u>(See note at end of Directory.)</u>	LEVEL 3
(1, -)	The COSCOM is concerned with planning and coordinating combat service support operations in support of the corps and internal operations, to include combat service support of subordinate units. The coordinating staff has a broad base and is oriented on logistic functions. Coordinating staff officers are designated.	
(2, -)	See (1, -) above.	
(3, -)	Subordinate elements of the COSCOM and DISCOM accomplish combat service support functions directed by higher echelons.	
NOTE: The general descriptions of force commanders by echelon given above must be combined with the functional properties of the command functions provided in Table 2.1 and Directory 2.1. Such a process will particularize the command processes to be represented at each echelon for each type of mission.		

TABLE 2.1.3 ENGINEER COMMANDERS

ITEM	INTERACTION					LEVEL 3
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
BATTALION	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
COMPANY	* * *	* * *	* *	* * *	*	
				* *	*	

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COMMANDERS

TABLE 2.1.4 FIRE SUPPORT COMMANDERS

ITEM	INTERACTION					LEVEL 3
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
CORPS	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
DIVISION	* * *	* * *	* *	* * *	*	
BATTALION	* * *	* * *	* *	* * *	*	
		*		* * *	*	

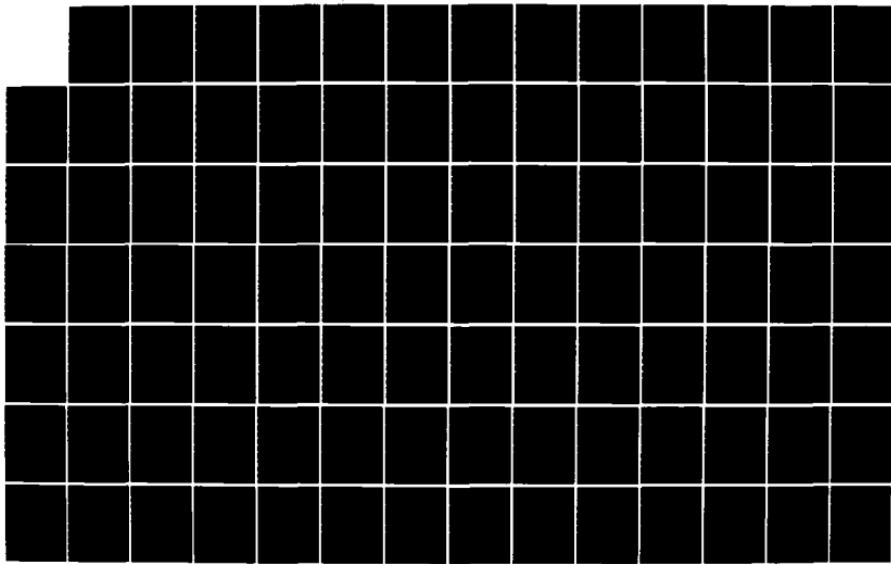
STAFF FORCES  
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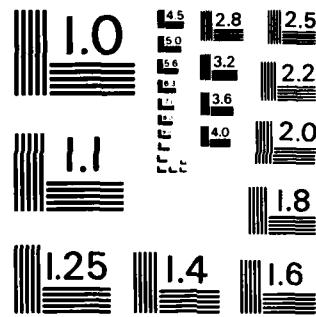
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Directory 2.1.3 Engineer Commanders

<u>(ITEM, INTERACTION)</u>	<u>DESCRIPTION</u> <u>(See note at end of Directory.)</u>	<u>LEVEL 3</u>
(1, -)	<p>The engineer battalion commander is also a special staff officer responsible to the division commander for all engineer related matters. The division engineer and his staff coordinate all engineer-related actions to ensure division requirements are met. Actions beyond the capability of the division are obtained through coordination with corps. The command and control method is based on the corps commander's overall tactical plan and his assessment of each division's contribution to that plan. The corps engineer advises the corps commander in making this decision.</p> <p>Also see Table 2.2.5, Item (19, -).</p>	
(2, -)	<p>At brigade, the engineer company commander is the brigade engineer and coordinates or directs all engineer activity in support of the brigade. Engineers are attached to maneuver units only when time and/or distance factors prohibit control by the parent engineer unit. Each committed brigade will have one division engineer company in direct support. When requirements exceed the capabilities of one company, additional resources from either the division engineer battalion or supporting corps engineer units are placed in support of the brigade under direction or coordination of the DS engineer company. This arrangement provides the brigade commander continuity and a centralized single source management for engineer matters.</p> <p>Also see Table 2.2.5, Item (20, -).</p>	
<p><b>NOTE:</b> The general descriptions of force commanders by echelon given above must be combined with the functional properties of the command functions provided in Table 2.1 and Directory 2.1. Such a process will particularize the command processes to be represented at each echelon for each type of mission.</p>		

#### Directory 2.1.4 Fire Support Commanders

(ITEM, INTERACTION)	DESCRIPTION (See note at end of Directory.)	LEVEL 3
(1, -)	See Table 2.2.5, Item (1, -).	
(2, -)	See Table 2.2.5, Item (2, -).	
(3, -)	See Table 2.2.5, Item (10, -).	

NOTE: The general descriptions of force commanders by echelon given above must be combined with the functional properties of the command functions provided in Table 2.1 and Directory 2.1. Such a process will particularize the command processes to be represented at each echelon for each type of mission.

**TABLE 2.1.5 INTELLIGENCE/ELECTRONIC WARFARE COMMANDERS**

ITEM	INTERACTION					LEVEL 3
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
BRIGADE	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
BATTALION	* * *	* * *	**	* * *	* *	

STAFF FORCES  
COMMANDERS

**TABLE 2.1.6 AIR DEFENSE ARTILLERY COMMANDERS**

ITEM	INTERACTION					LEVEL 3
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
BRIGADE	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
BATTALION	* * *	* * *	**	* * *		

STAFF FORCES  
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**TABLE 2.1.7 AIR-GROUND COMMANDERS**

ITEM	INTERACTION					LEVEL 3
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
BRIGADE AIR SPT	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
BRIGADE AIR ATK	* *	**	**	* * *	* *	

STAFF FORCES  
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Directory 2.1.5 Intelligence/Electronic Warfare Commanders

(ITEM, (INTERACTION)	<u>DESCRIPTION (See note at end of Directory)</u>	LEVEL 3
(1, -)	The corps MI assets support the development of intelligence, counterintelligence, electronic warfare support measures, and target development requirements which must be satisfied to provide the commander with information necessary to plan for and execute an operation. Assets from MI are provided to division and brigade.	
(2, -)	One intelligence and electronic warfare support element, one communications and jamming platoon, and one ground surveillance radar are provided to each brigade. The MI battalion provides an I/EW support element of one officer and one noncommissioned officer to each brigade.	
Note: The general descriptions of force commanders by echelon given above must be combined with the functional properties of the command functions provided in Table 2.1 and Directory 2.1. Such a process will particularize the command processes to be represented at each echelon for each type of mission.		

### Directory 2.1.6 Air Defense Artillery Commanders

<u>(ITEM, INTERACTION)</u>	<u>DESCRIPTION (See note at end of Directory.)</u>	<u>LEVEL 3</u>
(1, -)	See Table 2.2.5, Item (11, -).	
(2, -)	See Table 2.2.5, Item (12, -).	

Note: The general descriptions of force commanders by echelon given above must be combined with the functional properties of the command functions provided in Table 2.1 and Directory 2.1. Such a process will particularize the command processes to be represented at each echelon for each type of mission.

Directory 2.1.7 Air-Ground Commanders

<u>(ITEM, (INTERACTION)</u>	<u>LEVEL 3</u>
<u>DESCRIPTION (See note at end of Directory.)</u>	
(1, -)	The cavalry brigade, air attack commander directs a combat support aviation battalion, two attack helicopter battalions, and the division cavalry squadron. His mission is to find, fix, and destroy enemy armored and mechanized forces using fire and maneuver. Additionally, he supports reconnaissance, logistic, liaison, aerial observation, and MI operations.
(2, -)	The combat aviation battalion of the heavy division directs a general support aviation company, a combat support aviation company, two attack helicopter companies, and a transportation aircraft maintenance company. His mission is to provide aviation support for the headquarters and other divisional units in support of tactical operations.
<p>Note: The general descriptions of force commanders by echelon given above must be combined with the functional properties of the command functions provided in Table 2.1 and Directory 2.1. Such a process will particularize the command processes to be represented at each echelon for each type of mission.</p>	

TABLE 2.2 C2 STAFF

ITEM	INTERACTION					LEVEL 2									
	ORGANIZE			DIRECT		ALLOCATE		INFORM			REQUEST				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>PERSONAL</b>															
1 CORPS															
2 DIVISION															
<b>CHIEF OF STAFF</b>															
3 CORPS			*												
4 DIVISION			*												
5 BRIGADE (EXEC)			*												
<b>LIAISON</b>															
6 AIR FORCE		*			*	*			*		*	*		*	
7 NAVY											*			*	
8 SEPARATE UNIT				*							*			*	
<b>COORDINATING</b>															
9 PERSONNEL	*	*													
10 INTELLIGENCE	*	*			*	*									
11 OPERATIONS	*	*			*	*									
12 LOGISTICS	*	*			*	*									
13 CIVIL/MILITARY AFFAIRS															
<b>SPECIAL</b>															
14 FIRE SUPPORT	*	*	*												
15 AIR DEFENSE ARTILLERY	*	*													
16 AVIATION			*												
17 COMMUNICATIONS - ELECTRONICS			*												
18 CHEMICAL			*												
19 ENGINEER	*	*	*												
20 OTHER			*	*	*										

COMMANDERS  
STAFF FORCES

Directory 2.2 C<sup>2</sup> Staff

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(3, 5)	See Table 2.2.2	
(4, 5)	See Table 2.2.2	
(5, 5)	See Table 2.2.2	
(6, -)	Air Force liaison elements provide assistance to maneuver commanders in planning, coordinating, and requesting Air Force assets. Their role in the operations, especially air space management, exceeds that of other liaison officers.	
(7, -)	Naval Gunfire Officers request fires and report on the status of forces and missions.	
(8, -)	The separate unit liaison elements include Air Defense which support the maneuver unit operations officer in planning, coordinating, and directing ADA assets. The ADA liaison works with the Air Force and Navy liaison in the fire support element.	
(9, -)	Extended duration corps combat operations require consideration of the personnel functions. These functions are primarily executed at the service support command, but provide planning information to the corps maneuver commander and staff.	
(10, 2)	<u>Item:</u> Forces <u>Mechanism:</u> M6 <u>Factors:</u> <u>Representations:</u> Staff officers and elements prepare recommendations concerning the organization of staff and forces in the broad fields of personnel; intelligence; operations and training; logistics; and civil-military operations.	
(10, 3)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> The intelligence officer and his associated staff for each echelon are major contributors to combat operations. The G2/S2 elements interact with commanders, staff and force elements in developing intelligence related products for planning, coordinating, and executing unit missions. The G2/S2 functions require extensive interaction with other elements of the staff; they are performed at multiple locations and are critical for logistics, fire	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	<u>DESCRIPTION</u>	LEVEL 2
	support, and engineering as well as tactical fire and maneuver.	
(10, 5)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> The Chief of Staff exercises overall supervision of the main command post and represents the commander, when authorized. Other principal staff officers coordinate staff operations in their respective areas of responsibility.	
(10, 6)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> As authorized by the unit commander.	
(10, 9)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Staff officers and elements prepare recommendations concerning the allocation of forces in the broad fields of personnel; intelligence; operations and training; logistics; and civil-military operations.	
(10, 10)	<u>Item:</u> Commanders <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> The staff informs superior and subordinate commanders by developing and maintaining information sources for common use and by direct exchange of information. This exchange supports the decision-making process while recognizing specific staff relationships with subordinate commands.  1) Staff relationships with subordinate commands include the following:  (a) The staff must understand and support units of the command and avoid usurping responsibilities or prerogatives of subordinate commanders and staffs.  (b) A staff officer contacts a subordinate command to transmit orders or instructions, to provide advice and recommendations, to offer assistance, or to exchange information.	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, <u>INTERACTION</u> )	<u>DESCRIPTION</u>	LEVEL 2
	<p>(c) Normally, all orders from a higher HQ requiring or prescribing action by a subordinate unit of the command are issued by authority of the higher commander.</p> <p>(d) Subordinate commanders and staff may accept or reject staff recommendations, advice, or requests.</p> <p>(e) Command channel is the direct, official link between HQs through which all orders and instructions to subordinates are passed. Command channels are from commander to commander. Within granted authority, staff officers use command channels.</p> <p>2) The specific responsibilities and duties of a particular staff officer will vary depending on the level and type of organization, mission to be performed, and the personal desires of the commander. Activities of the staff focus on the purpose of the staff, to assist the commander. They center on five common functions: providing information, making estimates, making recommendations, preparing plans and orders, and supervising the execution of decisions. Information includes reports, summaries, and other products associated with planning. Continuous feedback from available sources supports on-going estimates and plans. Reports and summaries are used extensively to provide information to higher, lower, and adjacent commands. These include journals, operational situation reports (SITREP), as-required reports, spot reports, periodic intelligence report (PERINTREP), periodic operations report, and periodic logistics report.</p> <p>(a) Journals</p> <p>A journal is an official chronological record of events about a unit or a staff section during a given period of time. Journals are prepared and maintained during combat and as directed by a commander in accordance with AR 220-15, <u>Journals and Journal Files</u>. The assembled journals of the staff sections give a complete picture of the unit's operations for a given period and are a permanent record.</p>	

## Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>(b) Situation Maps</p> <p>A situation map is a graphic presentation of the current operational situation. Each staff section keeps its situation map up to date by posting unit dispositions and activities that concern the section. A general situation map may be supplemented with one or more overlays showing specific items (e.g., obstacles). When staff section personnel strength is inadequate or when activity is light, two or more staff sections may maintain situation maps jointly. This is particularly appropriate at brigade and lower levels.</p> <p>Situation maps should, as a minimum, show:</p> <ul style="list-style-type: none"><li>o Boundaries applicable to the current operation.</li><li>o Other control measures applicable to the staff section (e.g., a logistic situation map should reflect main supply routes and traffic control points).</li><li>o Command posts of adjacent units and of the next higher and lower levels of command.</li><li>o Locations of units and/or installations of significance to the staff section (e.g., a logistic situation map should reflect division and brigade support areas).</li><li>o Civilian installations, allied military installations, airfields, and rail networks, as appropriate.</li></ul>	
	<p>(c) Information Displays</p> <p>Information displays, automated or manual, may be required to supplement details contained on the situation map or to make information available that is not suitable for posting on the situation map. Information associated with the situation map is located adjacent to it for easy viewing and posting.</p> <p>Typical displays are in the form of charts which reflect information such as task organization,</p>	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>personnel status, status of supplies and equipment, organization and strengths (personnel and equipment) of the enemy, and communications status of units.</p> <p>Information displays should conform to the following guidelines:</p> <ul style="list-style-type: none"><li>o The purpose of the display determines which information will be displayed.</li><li>o The display readily must show the essential information.</li><li>o The display must be clearly understandable to people without specialized knowledge.</li><li>o The display must permit prompt changes. A display that is not current (or correct) is misleading and serves no useful purpose.</li></ul> <p>3) Decision-Making</p> <p>(a) Introduction</p> <p>The commander and staff continually face situations that involve uncertainties, questionable or incomplete data, and several possible alternatives. They must not only decide what to do but also recognize when a decision is necessary. A systematic approach to problem solving assists in applying thoroughness, clarity, judgment, logic, and professional knowledge to the task.</p> <p>Solutions to problems result from a logical and orderly process that consists of:</p> <ul style="list-style-type: none"><li>o Recognizing and defining the problem.</li><li>o Gathering the facts and making assumptions needed to determine the scope of and the solution to the problem.</li><li>o Developing possible solutions to the problem.</li></ul>	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"><li>o Analyzing and comparing possible solutions.</li><li>o Selecting the best solution to the problem.</li></ul> <p>(b) The Estimate of the Situation</p> <p>The purpose of the estimate of the situation is to collect and analyze relevant information for developing, within the limits imposed by the information and time available, the most effective solution to a problem.</p> <p>The estimate of the situation is applicable to any situation and any level or type of command.</p> <p>The estimate is as thorough as time and circumstances permit. The detail varies with the level and type of command. Information, conclusions, and recommendations from other pertinent estimates may be used.</p> <p>The estimate of the situation is a continuous process for the commander and staff. Estimates are revised continuously as factors that affect operations change, as new facts are recognized, as assumptions are replaced by facts or rendered invalid, or as changes to the mission are received or indicated.</p> <p>(c) Staff Estimates</p> <p>The staff assists the commander in reaching a decision by making estimates in their assigned areas of responsibility. The staff estimate results in conclusions and recommendations which identify feasible courses of action.</p> <p>Based on the commander's restated mission and planning guidance (if provided), the coordinating staff officers prepare their estimates assisted by special staff officers, who may prepare their own estimates. These estimates result in recommendations to the commander as to the actions that should be taken to accomplish the mission. Preparation of staff estimates is continuous, with staff officers</p>	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>exchanging information with each other as they develop their estimates concurrently.</p> <p>Besides supporting the commander's estimate, staff estimates assist the staff officer in determining the detailed actions necessary to accomplish the overall mission. Staff estimates include the following:</p> <ul style="list-style-type: none"> <li>o Intelligence Estimate. The intelligence estimate analyzes the characteristics of the area of operations and the enemy situation as they can affect the accomplishment of the mission. It draws conclusions and makes recommendations, as appropriate, concerning the effect of the area of operations on friendly and enemy forces, probable enemy courses of action, enemy vulnerabilities which can be exploited, and the feasibility of various friendly courses of action.</li> <li>o Operation Estimate. The operation estimate analyzes factors affecting the accomplishment of the mission to determine all reasonable courses of action and the effect of these courses of action on friendly forces. It recommends a course of action for accomplishing the mission. The operation estimate and the commander's estimate use the same format and generally have the same content; however, the operation estimate culminates in a recommendation rather than a decision.</li> <li>o Logistic Estimate. The logistic estimate analyzes logistic factors affecting accomplishment of the mission. It draws conclusions and makes recommendations concerning the logistic feasibility of various courses of action and the effects of each course of action on logistic operations.</li> <li>o Other Staff Estimates. Staff estimates are not limited to those described above. Every staff officer makes an estimate of the situation as it pertains to his area of responsibility. Examples are the Fire Support Coordinator (FSCOORD) and the Communications-Electronics Officer (CEO).</li> </ul>	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>It is the duty of the staff to keep the commander continuously informed of those things he needs to know but to avoid burdening him with unnecessary information. The choice of what to communicate to the commander is based on the staff officer's knowledge of the situation, the commander's instructions, and good judgment.</p> <p>The commander and staff exchange information about the mission and the staff provides the commander with information about the current situation that is needed to conduct or complete mission analysis.</p>	
	<p>4) Feedback</p> <p>Refinement of plans and orders takes place constantly. After a decision is transmitted to units for execution, facts and situations that pertained when the order was published may be altered. Feedback of information is received through reports and personal observations by the commander, the staff, or subordinate commanders and staff.</p>	
(10, 11)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representations:</u> The staff informs superior, subordinate, and internal command staff by developing and maintaining information sources for common use. Estimates and plans developed by the staff are particularly important items for transferring information.</p> <p>1) Staff relationships with subordinate command staff include the following:</p> <p>(a) Staff officers are assigned functional areas of interest and responsibility for accomplishing staff actions within those areas.</p> <p>(b) The assignment of staff responsibilities carries no connotation of command authority over other staff officers or over any other elements of the command.</p>	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
	<p>(c) The commander specifically delegates authority to the staff or to a particular staff officer; formal notification of such delegation is disseminated.</p> <p>(d) The staff-to-staff link between HQs for coordination and transmission of information in the staff channel.</p> <p>(e) The link between two commands used for transmission of technical instructions in the technical channel.</p> <p>2) Reports and summaries are used extensively to provide information to higher, lower, and adjacent commands. These include journals, operational situation reports (SITREP), as-required reports, spot reports, periodic intelligence report (PERINTREP), periodic operations report, and periodic logistics report. Maps and displays also serve as means of communication.</p> <p>(a) Journals</p> <p>(1) A journal is an official chronological record of events about a unit or a staff section during a given period of time. Journals are prepared and maintained during combat and as directed by a commander in accordance with AR 220-15, <u>Journals and Journal Files</u>.</p> <p>(2) The assembled journals of the staff sections give a complete picture of the unit's operations for a given period and are a permanent record.</p> <p>(b) Situation Maps</p> <p>(1) A situation map is a graphic presentation of the current operational situation. Each staff section keeps its situation map up to date by posting unit dispositions and activities that concern the section. A general situation map may be supplemented with one or more overlays showing specific items (e.g., obstacles). When staff section personnel strength is inadequate or when activity is light, two or more staff sections may maintain</p>	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>situation maps jointly. This is particularly appropriate at brigade and lower levels.</p> <p>(2) Situation maps should, as a minimum, show:</p> <ul style="list-style-type: none"><li>o Boundaries applicable to the current operation.</li><li>o Other control measures applicable to the staff section (e.g., a logistic situation map should reflect main supply routes and traffic control points).</li><li>o Command posts of adjacent units and of the next higher and lower levels of command.</li><li>o Locations of units and/or installations of significance to the staff section (e.g., a logistic situation map should reflect division and brigade support areas).</li><li>o Civilian installations, allied military installations, airfields, and rail networks, as appropriate.</li></ul> <p>(c) Information Displays</p> <p>(1) Information displays, automated or manual, may be required to supplement details contained on the situation map or to make information available that is not suitable for posting on the situation map. Information associated with the situation map is located adjacent to it for easy viewing and posting.</p> <p>(2) Typical displays are in the form of charts which reflect information such as task organization, personnel status, status of supplies and equipment, organization and strengths (personnel and equipment) of the enemy, and communications status of units.</p> <p>(3) Information displays should conform to the following guidelines:</p>	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<ul style="list-style-type: none"> <li>o The purpose of the display determines which information will be displayed.</li> <li>o The display readily must show the essential information.</li> <li>o The display must be clearly understandable to people without specialized knowledge.</li> <li>o The display must permit prompt changes. A display that is not current (or correct) is misleading and serves no useful purpose.</li> </ul>	
3)	Staff message control is the system of processing messages and correspondence within a headquarters. The principal purposes of staff message control are to:	
	<ul style="list-style-type: none"> <li>(a) Receive, dispatch, and record messages and correspondence entering and leaving the headquarters.</li> <li>(b) Reproduce and route copies to proper staff members for action and information.</li> <li>(c) Maintain controls to ensure prompt action by action agencies.</li> <li>(d) Establish priority of action.</li> <li>(e) Control the use of security classifications and precedence designation on outgoing communications.</li> </ul>	
4)	Routing and distribution of messages and correspondence are dependent on effective control procedures and a continuing sense of urgency on the part of messengers and message center personnel. The communications-electronics officer and adjutant general have specific responsibilities for maintaining staff message control and ensuring that efficient routing and delivery procedures are established and followed. However, individual staff officers must not rely completely on others; they must assume direct responsibility for ensuring that critical messages are processed expeditiously and reach their destination promptly.	

## Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	5) Staff Estimates. Based on the commander's restated mission and planning guidance (if provided), the coordinating staff officers prepare their estimates assisted by special staff officers who may prepare their own estimates. These estimates result in recommendations to the commander as to the actions that should be taken to accomplish the mission. Preparation of staff estimates is continuous, with staff officers exchanging information with each other as they develop their estimates concurrently.	
	6) Plans and Planning	
	(a) Necessity for Planning	
	(1) Planning is a continuous process in preparation for future assigned or assumed tasks. It involves a detailed and systematic examination of all aspects of contemplated operations.	
	(2) Planning and preparing plans are integral parts of the military decision-making process. Planning makes future operations easier by permitting subsequent rapid coordinated action by the staff and other elements of the command. It also keeps subordinate elements of the command informed of possible requirements and keeps the command in a better position to respond to rapidly changing situations.	
	(3) Adequate, practical planning is essential to the success of any military undertaking. The larger the unit, the greater the need to foresee and plan for longer range future operations.	
	(b) The Staff in Planning	
	(1) The staff continually plans for future operations. The extent of this planning varies with the level of command.	
	(2) In planning, each staff member considers those features of the operation that are in his areas of interest. He investigates the effects of these features on unit operations and on the	

## Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	plans of other staff sections. Normally, he prepares the plans that are in his area of staff responsibility.	
(c) Plans		
(1) General	A plan is a method or a scheme for a military action. It is a proposal to carry out a command decision or project. As part of the planning process, a plan represents the command's preparation in a specific area to meet a particular event. Although plans are based on specific conditions or assumptions, they are not static. Plans are changed, refined, and kept current as a result of continuing estimates and studies.	
(2) Operation Plan	This plan is for a military operation. It covers a single operation or a series of connected operations to be carried out simultaneously or in succession. It implements operations derived from a higher echelon plan.	
(3) Administrative/Logistics Plan	This plan applies to combat service support operations. It is based on the command's operational requirements, as determined by appropriate estimates. When put into effect, it is the administrative/logistics order.	
(4) Other Plans	A supporting plan complements another plan. An alternative plan provides for the accomplishment of a mission in a different manner. A contingency plan provides for major contingencies that can reasonably be anticipated in the principal geographic subareas of the command.	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>(d) Planning</p> <p>(1) Planning Sequence</p> <p>The planning sequence is a series of steps representing a logical progression of command and staff actions required to develop plans. At higher staff levels (e.g., corps), planning may be a formal process with separate and distinct steps. At lower levels, the process is usually a continuous, largely mental process. The planning sequence is as follows:</p> <ul style="list-style-type: none"> <li>o Forecast to determine probable requirements.</li> <li>o Study probable requirements and establish priority of further preparation.</li> <li>o Study implications of requirements to formulate an assumed mission.</li> <li>o Analyze mission to determine tasks.</li> <li>o Establish guidance.</li> <li>o Prepare planning studies.</li> <li>o Select course(s) of action.</li> <li>o Prepare complete plans.</li> </ul> <p>(2) Organization for Planning</p> <p>There are four fundamental methods or organizing the staff for planning.</p> <ul style="list-style-type: none"> <li>o Use the existing organization without change.</li> <li>o Create a permanent planning section or subsection.</li> <li>o Use a temporary planning committee.</li> <li>o Use a combination of the above methods.</li> </ul>	

## **Directory 2.2 C<sup>2</sup> Staff (Continued)**

(ITEM, (INTERACTION)	DESCRIPTION
	<b>(3) Planning Method</b>
	Two methods are commonly used to determine the actions, units, sequences, and procedures that must be employed to accomplish an assigned mission. One method is to begin with the objective and the time it is to be attained and work backward. This technique develops the units, organization, combat service support, and other essentials needed to gain the objective. The relative time sequence and organizational placement will emerge from this technique. As the visualization continues, the need for specific tasks, conditions, or assumptions and their relative placement become apparent. Another method is to begin with the current position and plan through each intermediate step to the final objective. The important thing is to choose a starting point and then proceed to the logical conclusion.
	<b>(4) Planning Program</b>
	A planning program is a schedule for performing a series of planning tasks in a particular order. It is a valuable aid in coordinating all matters essential to the planning process.
	<b>(5) Time Element in Planning</b>
	The time required to plan and initiate an operation varies with the size of the unit. At battalion, an operation may be planned and initiated within a few hours. In this case, the plan may result from a brief estimate of the situation and a decision that is applicable to the immediate future. At corps, several months may be required to plan and initiate a major operation. The amount of detail considered in the preparation of the plan will vary, depending on the size and type of command, the experience of the troops, the complexity of the operation, the factors of combined or joint participation, and the time available for planning.

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	<p>Concurrent planning by different levels of command and different staff sections conserves time and promotes the early detection and solution of problems. However, this does not relieve higher levels of the responsibility to provide information and instructions to subordinate units as early as possible. At successive levels, planning includes those details required for that particular level. Coordination between higher and subordinate units, through conferences and visits during planning, helps pinpoint problems and their solutions. The extent to which planning can be concurrent depends on many factors, including time and distance between the levels of command involved and security considerations. Because each subordinate unit involved in the operation performs its own planning, based on that of the next higher level, allocation of adequate time for subordinate unit planning is a consideration at each command level. Failure to provide this time can create confusion at lower levels and negate the planning efforts of the higher headquarters.</p> <p>(6) Coordination of Planning</p> <p>Coordination ensures that the elements of planned action fit together. In military application, coordination includes establishment of phases in planned operations as points where actions and positions of forces must fit.</p> <p>(7) Planning by Supporting Units</p> <p>Supporting units have a special consideration that adds to the complexity of their planning. All elements must consider the physical environment, the enemy, and higher headquarters. Supporting elements, however, must also base their planning on the plan of the supported command. This consideration is more than the simple addition of a single variable to the conditions facing a supporting unit. The various courses of action that the supported unit may take, during planning and execution, have great impact on the planning of</p>	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	a supporting agency and demand flexibility in execution. Careful consideration by all staff officers of the special problems facing supporting units will assist supporting elements in planning for rapid response to the supported units.	
(10, 12)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Staff officers and elements provide subordinate forces with operations and intelligence information (including current and future OPLANS/orders). Specific targeting information is provided as authorized and required.	
(10, 13)	<u>Item:</u> Commanders <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Staff officers may request additional guidance from commander.	
(10, 14)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Staff officers and elements request information from other staff officers and elements in adjacent, superior, and subordinate commands in order to develop estimates, coordinate plans, and supervise execution of orders. Other requests include combat support and combat service support for sustaining operations.	
(10, 15)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Staff officers and elements request information from subordinate and support command forces in order to develop estimates, develop plans, and supervise execution of orders. Other requests include combat support and combat service support for sustaining operations.	
(11, -)	The operations officer and his associated staff at each echelon represent the focal point of all military operations for the unit. Next to the commander, the G3/S3 officers exert the primary influence on and direction for all staff products and force actions. As a consequence, the operations officers interact with virtually all elements of the staff and	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, <u>INTERACTION</u> )	DESCRIPTION	LEVEL 2
	subordinate commands. Operations officers at support commands are equally influential in accomplishing the mission of the unit.	
(12, -)	For extended duration corps operations, the logistics aspects of combat are of special importance. Staff operations within the service support commands as well as the G4/S4 logistics officer with the maneuver command must be considered. Many of the basic logistic operations are determined within the support command elements. These are coordinated with the maneuver operation, but the information and decision-making processes are located outside the force and maneuver element functions.	
(13, -)	No direct requirement for civil/military operations has been specified; however, corps operations will necessarily involve extensive interaction with civilian elements. These interactions will be both supportive and disruptive.	
(14, -)	Fire support officers and their associated staff elements at each echelon and support unit work closely with maneuver commanders, operations staff, and intelligence staff. Effective fire support from both artillery and air assets are critical to successful combined arms operations. The fire support staff provides assistance, advises in planning, coordinating, and requesting fire support. Coordination of fire support requires interaction with all staff and component elements of the force. These interactions are particularly critical due to the physical separation of fire support forces and the use of separate communications channels.	
(15, -)	Air Defense Artillery officers and their associated staff elements at each echelon and support unit work closely with the maneuver unit commander and the FSE. The ADA officers also provide information concerning air and air defense to coordinating staff officers.	
(16, -)	Aviation officers and their associated staff elements at each echelon assist in the planning and supervision of Army aviation operations for both combat and combat support. In particular, the aviation officers support air space management functions.	
(17, -)	The communications-electronics officers and associated staff elements at each echelon from corps through brigade provide planning and coordination of communications for the total force. The C-E officers provide critical advice concerning	

Directory 2.2 C<sup>2</sup> Staff (Continued)

(ITEM, (INTERACTION)	DESCRIPTION	LEVEL 2
	distribution of communications assets, electronic warfare, command post locations, etc.	
(18, -)	The chemical officers and associated staff elements at each echelon from corps through brigade assist in planning, directing, and coordinating nuclear, chemical, and biological weapons as well as providing advice on defensive operations. Coordination includes interfaces with fire support elements, logistics, etc.	
(19, -)	The engineer officers and their associated staff elements at corps and division echelon provide planning and supervising actions for the major engineer functions: mobility, countermobility, survivability, and general engineering. Lower echelon engineer elements coordinate with the supported maneuver unit commanders and staffs.	
(20, -)	Other staff officers and elements of particular importance include weather and transportation.	

TABLE 2.2.1 C2 PERSONAL STAFF

ITEM	INTERACTION					LEVEL 3
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
CORPS	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
DIVISION						

STAFF  
FORCES  
COMMANDERS

TABLE 2.2.2 C2 CHIEF OF STAFF

ITEM	INTERACTION					LEVEL 3
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
CORPS	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
1 CHIEF OF STAFF		*				
DIVISION						
2 CHIEF OF STAFF		*				
BRIGADE						
3 EXECUTIVE OFFICER		*				

STAFF  
FORCES  
COMMANDERS

TABLE 2.2.3 C2 LIAISON STAFF

ITEM	INTERACTION					LEVEL 3
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
AIR FORCE	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
1 CORPS ALO	*	*	*	*	*	
2 DIVISION ALO	*	*	*	*	*	
3 BRIGADE ALO	*	*	*	*	*	
NAVY						
4 CORPS NGFO				*	*	
5 DIVISION NGFO				*	*	
SEPARATE UNIT						
6 BRIGADE ADA LO		*		*		
7 BRIGADE FSO				*	*	

STAFF  
FORCES  
COMMANDERS

Directory 2.2.1 C<sup>2</sup> Personal Staff

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
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	No requirements were identified for a personal staff; space reserved for future consideration.	
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## Directory 2.2.2 Chief of Staff

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(1, 5)	<p><u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Exercises overall supervision of the main command post and represents the commander, when authorized. Guidance, direction, and information normally go from the commander through the CofS.</p>	
(2, 5)	Same as (1, 5) above.	
(3, 5)	Similar to (1, 5) above.	

Directory 2.2.3 C<sup>2</sup> Liaison Staff

<u>(ITEM, INTERACTION)</u>	<u>LEVEL 3</u>
<u>DESCRIPTION</u>	
(1, 3)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Assists in planning the simultaneous employment of air and surface fires.
(1, 5)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Supervises forward air controllers (FACs).
(1, 6)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Assists the fire support team (FIST) chief in directing airstrikes in the absence of a FAC.
(1, 9)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Coordinates close air support (CAS) with the fire support element (FSE).
(1, 10)	<u>Item:</u> Commander <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Advises the commander and staff on the capabilities, limitations, and employment of tactical air (TACAIR) (close air support, battlefield air interdiction, joint suppression of enemy air defenses, reconnaissance, and airlift).
(1, 11)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Advises the commander and staff on the capabilities, limitations, and employment of tactical air (TACAIR) (close air support, battlefield air interdiction, joint suppression of enemy air defenses, reconnaissance, and airlift). Operates the Air Force air request ratio net. Provides liaison for local air defense measures. Prepares necessary annexes for approval and authentication.
(1, 15)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Operates the Air Force air request radio net.

Directory 2.2.3 C<sup>2</sup> Liaison Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(2, 3)	See (1, 3) above.	
(2, 5)	See (1, 5) above.	
(2, 6)	See (1, 6) above.	
(2, 9)	See (1, 9) above.	
(2, 10)	See (1, 10) above.	
(2, 11)	See (1, 11) above.	
(2, 15)	See (1, 15) above.	
(3, 3)	See (1, 3) above.	
(3, 5)	See (1, 5) above.	
(3, 9)	See (1, 9) above.	
(3, 10)	See (1, 10) above.	
(3, 11)	See (1, 11) above.	
(3, 15)	See (1, 15) above.	
(4, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Reports of missions completed. Advise on availability of fire support.	
(4, 15)	<u>Item:</u> Naval Support <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Orders to execute preplanned fires or immediate requests for fires.	
(5, 11)	See (4, 11) above.	
(5, 15)	See (4, 15) above.	
(6, 6)	<u>Item:</u> ADA Units <u>Mechanism:</u> <u>Factors:</u>	

Directory 2.2.3 C<sup>2</sup> Liaison Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p><u>Representation:</u> Determines requirements for ADA units and recommends their allocation to subordinate units. Ensures coordination of Army ADA operations within the force; assists in airspace management function.</p>	
(6, 11)	<p><u>Item:</u> Brigade S3 Air</p> <p><u>Mechanism:</u></p> <p><u>Factors:</u></p> <p><u>Representation:</u> Monitoring of the status, activity, location of air defense and aviation assets. Prepares ADA annex to plans.</p>	
(7, 11)	<p><u>Item:</u> Brigade S3 Air, Brigade S3</p> <p><u>Mechanism:</u></p> <p><u>Factors:</u></p> <p><u>Representation:</u> Monitoring of the status, activity, location of artillery units. Prepares artillery support annex to plans.</p>	
(7, 15)	<p><u>Item:</u> DS Btrys</p> <p><u>Mechanism:</u></p> <p><u>Factors:</u></p> <p><u>Representation:</u> Requests for immediate or preplanned support fires.</p>	

**TABLE 2.2.4 C2 COORDINATING STAFF**

ITEM	INTERACTION						LEVEL 3									
	ORGANIZE			DIRECT		ALLOCATE		INFORM			REQUEST					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<b>PERSONNEL</b>																
1 CORPS (COSCOM G1)	*	*	*				*	*		*	*					
2 DIVISION (DISCOM G1)	*	*	*				*	*		*	*					
<b>INTELLIGENCE</b>																
3 CORPS G2	*	*	*	*	*	*		*		*	*		*			
4 DIVISION G2	*	*	*		*	*		*		*	*		*			
5 BRIGADE S2		*			*			*		*	*	*		*	*	
6 BATTALION S2		*			*			*		*	*	*		*	*	
<b>OPERATIONS</b>																
7 CORPS G3	*	*	*		*	*		*		*	*	*		*	*	
8 COSCOM SOTI		*			*	*		*		*	*		*			
9 DIVISION G3	*	*	*		*	*		*		*	*	*		*	*	
10 DISCOM SOTI	*				*			*		*	*			*		
11 DIVARTY S3	*				*			*			*					
12 BRIGADE S3	*				*			*		*	*	*		*		
13 BATTALION S3		*				*			*		*	*		*		
<b>LOGISTICS</b>																
14 COSCOM SERVICES		*			*			*		*	*					
15 COSCOM MATERIEL		*			*			*		*	*			*		
16 COSCOM TRANS	*	*			*			*		*	*					
17 COSCOM C-M OPS		*				*				*	*					
18 DISCOM SERVICES		*				*				*	*					
19 DISCOM MATERIEL		*				*				*	*			*		
20 DISCOM TRANS	*	*				*				*	*					
21 DISCOM C-M OPS		*								*	*					
<b>CIVIL/MILITARY AFFAIRS</b>																
	COMMANDERS	STAFF	FORCES													

Directory 2.2.4 C<sup>2</sup> Coordinating Staff

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(1, 2)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The ACofS, personnel, has primary coordinating staff responsibility for:</p> <ul style="list-style-type: none"> <li>a) Developing policies and plans for technical training and technical control of operations of support command units providing personnel service support for which the support command has mission responsibility.</li> <li>b) Providing advice and assistance to supported unit commanders on personnel service support matters, and maintaining liaison with supported and supporting units.</li> </ul>	
(1, 3)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The ACofS, personnel, has primary coordinating staff responsibility for developing policies and plans for technical training and technical control of operations of support command units providing personnel service support for which the support command has mission responsibility.</p>	
(1, 8)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u></p> <ul style="list-style-type: none"> <li>a) Developing estimates and studies of requirements and recommending allocations and priorities for support command personnel and units engaged in personnel service support functions.</li> <li>b) Developing and recommending the troop basis and The Army Authorization Document System (TAADS) changes pertaining to personnel service support functions.</li> </ul>	
(1, 9)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> Developing estimates and studies of requirements and recommending allocations and priorities for support command personnel and units engaged in personnel service support functions.</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(1, 10)	<u>Item:</u> Commander <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Providing advice and assistance to supported unit commanders on personnel service support matters, and maintaining liaison with supported and supporting units.	
(1, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> The ACoS, personnel, has primary coordinating staff responsibility for: <ul style="list-style-type: none"> <li>a) Developing policies and plans for technical training and technical control of operations of support command units providing personnel service support for which the support command has mission responsibility.</li> <li>b) Developing estimates and studies of requirements and recommending allocations and priorities for support command personnel and units engaged in personnel service support functions.</li> </ul>	
(2, 2)	See (1, -) above.	
(3, 2)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> The intelligence officer is the principal staff officer for the commander on all military intelligence matters. In coordination with other command and staff elements and through the efficient use of plans, orders, and SOPs directs all elements in the intelligence and counterintelligence support roles.	
(3, 3)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> The G2 organizes forces by developing plans which identify specific units and missions. <ul style="list-style-type: none"> <li>1) Identifying requirements for reconnaissance, surveillance, and target acquisition (RSTA), and recommending unit tasking to support those requirements in coordination with the G3.</li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(3, 5)	<p>2) Planning, coordinating, and supervising efforts to detect, neutralize, and/or manipulate enemy intelligence activities and protection against espionage, subversion, and sabotage. Specifically assists the G3 in planning deception operations and evaluates the command vulnerability to nuclear weapons.</p> <p>3) Developing plans and coordinating ground reconnaissance of the command to include ground-based signals intelligence assets.</p> <p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The intelligence officer is the principal staff officer for the commander on all military intelligence matters. In coordination with other command and staff elements and through the efficient use of plans, orders, and SOPs directs all elements in the intelligence and counterintelligence support roles. The G2 has primary coordinating staff responsibility for:</p> <ul style="list-style-type: none"> <li>1) Production of Intelligence <ul style="list-style-type: none"> <li>(a) Maintaining a current intelligence estimate of the situation in coordination with other staff officers.</li> <li>(b) Recommending essential elements of information (EEI) and other intelligence requirements (OIR) to meet the commander's intelligence requirements.</li> <li>(c) Identifying requirements for reconnaissance, surveillance and target acquisition (RSTA), and recommending unit tasking to support those requirements in coordination with the G3.</li> <li>(d) Supervising and coordinating the commander's intelligence collection and target acquisition activities.</li> <li>(e) Conducting intelligence preparation of the battlefield.</li> <li>(f) Processing information and data into intelligence including recording, integrating, correlating, evaluating, interpreting, and disseminating information.</li> </ul> </li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<ul style="list-style-type: none"> <li>(g) Supervising and coordinating predictions of nuclear fallout, of chemical agent detection, biological agent sampling, and radiological surveys with the chemical officer.</li> <li>(h) Exercising staff supervision over organic and attached collection management and dissemination and intelligence production elements.</li> <li>(i) Coordinating and consolidating the command's requirement for weather and terrain analysis support.</li> <li>(j) Recommending targets to the fire support coordinator.</li> </ul>	
2)	Counterintelligence	
	<p>Planning, coordinating, and supervising efforts to detect, neutralize, and/or manipulate enemy intelligence activities and protection against espionage, subversion, and sabotage. Specifically assists the G3 in planning deception operations and evaluates the command vulnerability to nuclear weapons.</p>	
3)	Other	
	<ul style="list-style-type: none"> <li>(a) Assist G3 in electronic warfare operations by recommending proposed area of operations.</li> <li>(b) Assesses and inputs to appropriate staff sections enemy NBC capabilities.</li> <li>(c) Supervises the staff weather officer and supporting engineering terrain analysis team.</li> <li>(d) Recommending the employment of military intelligence units.</li> </ul>	
(3, 6)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The intelligence officer is the principal staff officer for the commander on all military intelligence matters. In coordination with other command and staff elements and through the efficient use of plans, orders, and SOPs directs all elements in the intelligence and counterintelligence support roles.</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(3, 9)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The G2 submits requirements for intelligence units to G3; recommends priority and allocation of intelligence units, personnel, and equipment.</p>	
(3, 10)	<p><u>Item:</u> Commanders  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The G2 informs commanders by making recommendations and presenting processed intelligence.</p> <ul style="list-style-type: none"> <li>1) Recommending essential elements of information (EEI) and other intelligence requirements (OIR) to meet the commander's intelligence requirements.</li> <li>2) Processing information and data into intelligence including recording, integrating, correlating, evaluating, interpreting, and disseminating information.</li> <li>3) Recommends EEI/OIR to the commander based on other staff officer requirements (disseminates approved EEI).</li> </ul>	
(3, 11)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The G2 informs the various members of the staff by developing and maintaining intelligence related sources of information; by directly coordinating with other staff members; and by disseminating intelligence related information on a routine or request basis.</p> <ul style="list-style-type: none"> <li>1) General Information Development and Support <ul style="list-style-type: none"> <li>(a) Preparation of intelligence estimate and intelligence preparation of the battlefield (IPB). Develops detailed knowledge of the enemy, weather, and terrain. Disseminates IPB products such as analyses of area of operations. IPB products are used by all staff officers for their estimates.</li> <li>(b) Processing information and data into intelligence including recording, integrating, correlating, evaluating, interpreting, and disseminating information.</li> </ul> </li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, <u>INTERACTION</u> )	DESCRIPTION	LEVEL 3
	<p>(c) The G2 based on commander's guidance, develops EEI and after approval by commander, submits to G3 for inclusion in OPLAN or OPORD. Submits intelligence orders and requests to combat and combat support units (other than those under G2 operational control) to G3 for coordination with other requirements. Provides G3 with continuing intelligence and makes recommendations concerning the plan as affected by the changing intelligence situation. Prepares and authenticates intelligence annex to OPLAN/OPORD.</p>	
	<p>(d) Surveillance. Plans for systematic watch of the battlefield. Assigns mission priorities. Coordinates all surveillance activities.</p>	
	<p>(e) Target Acquisition. Plans target acquisition in coordination with G3. Develops collection missions and coordinates collection of target information. Designates potential targets and disseminates the information to the staff.</p>	
	<p>(f) Nuclear Fallout. Prediction of fallout for nuclear weapons employed by the enemy. Estimates effects of the predicted fallout on the area of operations and enemy capabilities; disseminates to staff and subordinate units. Receives information from subordinate and adjacent units, command agencies, and higher headquarters on the G2 location of attack, type of burst, and yield of enemy-delivered nuclear weapons; collates, processes, and disseminates information to staff and affected units.</p>	
	<p>(g) Technical Intelligence. Coordinates technical intelligence activities. Uses technical intelligence in estimates and studies. Disseminates technical intelligence to appropriate parties.</p>	
	<p>(h) Weather Information. Establishes, coordinates, and consolidates Army weather requirements. Requests weather information from air weather service. Disseminates weather information to the command. Interprets weather information and effects on weapons systems and tactics. Interprets enemy potential to exploit the use of weather.</p>	
	<p>(i) The G2 provides commander and staff with the current intelligence situation. Exercises coordinating</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>staff supervision over all intelligence and counter-intelligence activities of the command.</p> <p>(j) Advises appropriate coordinating staff officers on ability to support operations and on the impact of current and planned operations.</p> <p>(k) The G2 estimates effects of the predicted fallout on the area of operations and enemy capabilities; disseminates to staff. Estimates effect the predicted fallout will have on intelligence operations and revises collection plan as required.</p> <p>(l) Assesses and inputs to appropriate staff sections enemy NBC capabilities.</p> <p>2) G3 Information Support</p> <p>(a) Identify requirements for reconnaissance, surveillance, and target acquisition (RTA), and recommending unit tasking to support those requirements in coordination with the G3.</p> <p>(b) The G2 prepares counterintelligence estimates. Plans and supervises implementation of counterintelligence measures to support all operations. Provides G3 with advice and recommendations concerning the counterintelligence aspects of deception. Provides G3 with advice and recommendations concerning EW and OPSEC estimates and annexes to plans and orders.</p> <p>(c) Planning and supervising, in coordination with G3, all EW activities in support of tactical operations.</p> <p>(d) Supervising and coordinating with the G3 and the communications-electronics (C-E) officer the evaluation of meaconing, interference, jamming, and intrusion (MIJI) reports.</p> <p>(e) Supervising and coordinating analysis of the OPSEC posture of the command with the G3, the C-E officer, and other staff officers.</p> <p>(f) Coordinating evaluation of enemy intelligence threat with the G3.</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	(g) Determining requirements and/or opportunities for deception operations in coordination with the G3 and recommending the deception objective.	
	(h) Recommending the deception story in coordination with the G3.	
	(i) The G2 provides G3 with intelligence estimate and analysis of area of operations.	
	(j) The G2 provides G3 with intelligence on enemy capabilities and vulnerabilities; develops list of potential targets for attack by fire support means. Directs collection effort to detect indications of potential targets and to develop detailed target information.	
	(k) The G2 plans and coordinates intelligence gathering through electronic support measures (ESM) in support of the EW mission. Coordinates intelligence portions of the EW estimate and annex. Recommends the use of electronic combat against enemy surveillance measures.	
	(l) The G2 provides information on enemy intelligence threat. Provides information on information security measures. Recommends the use of electronic combat against enemy surveillance resources.	
	(m) The G2 assists in preparation of deception plan by identifying enemy susceptibility to deception and determining enemy surveillance capabilities.	
	(n) The G2 provides advice and recommendations concerning intelligence and counterintelligence aspects (RAOO).	
	(o) The G2 advises G3 concerning counter intelligence aspects. Provides information of weather, terrain, and enemy situation.	
	(p) The G2 provides C-E officer with intelligence on, and estimate of enemy capability to interfere with signal communications. Supervises counterintelligence aspects of signal communications. Submits requirements for signal communications to G3. Submits GUARDED frequency list to G3.	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	(q) The G2 submits requirements for intelligence units to G3; recommends priority and allocation of intelligence units, personnel, and equipment.	
3) G4 Information Support		
	(a) The G2 provides G4 with information of the enemy capabilities of interfering with the logistic support mission and of the characteristics of the area of operations which may affect the logistic support mission.	
	(b) The G2 informs G4 of any observation noted concerning maintenance within the command.	
	(c) The G2 provides information on the area of operations as it affects the use of transportation.	
	(d) The G2 keeps G4 informed of enemy capabilities that may interrupt use of routes.	
	(e) The G2 provides G4 with enemy situation and capabilities as affecting location of logistic installations and time of movement.	
	(f) The G2 provides information on the enemy situation for consideration in locating rear boundary.	
	(g) The G2 provides information on characteristics of the area of operations and enemy capabilities for consideration in logistic planning.	
	(h) The G2 provides information on the area of operations and enemy capabilities which may affect the selection of the MSR.	
4) FSCOORD Information Support		
	(a) Recommending targets to the fire support coordinator.	
	(b) The G2 provides G3 with intelligence on enemy capabilities and vulnerabilities; develops list of potential targets for attack by fire support means. Directs collection effort to detect indications of potential targets and to develop detailed target information.	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>5) Communications-Electronics (C-E)</p> <p>(a) G2 coordinates and supervises analysis of OPSEC posture of the command with the C-E officer.</p> <p>(b) Supervising and coordinating with C-E officer the evaluation of meaconing, interference, jamming, and intrusion (MIJI) reports.</p> <p>(c) The G2 provides C-E officer with intelligence on, and estimate of enemy capability to interfere with signal communications. Supervises counterintelligence aspects of signal communications. Submits requirements for signal communications to G3. Submits GUARDED frequency list to G3.</p> <p>6) Air Defense Artillery Officer Information Support</p> <p>Coordinates with the ADA officer the integration of ADA operations into the overall intelligence system.</p>	
(3, 13)	<p><u>Item:</u> Commanders  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u></p> <p>1) Aerial Reconnaissance (Army Aviation)</p> <p>Originates requests and consolidates and screens requests from other staff elements, agencies, or units to include electronic support measures (ESM) employing Army aviation platforms. Disseminates results of reconnaissance. Coordinates use of air reconnaissance with other collection activities.</p> <p>2) Aerial Reconnaissance (Supporting Services)</p> <p>Originates requests for air reconnaissance to include ESM employing supporting services aerial platforms. Consolidates and screens requests from other staff elements, agencies, and units. Disseminates results of reconnaissance.</p>	
(4, 2)	See (3, -) above.	
(5, -)	Basic functions performed per (3, -) above.	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(6, -)	Basic functions performed per (3, -) above.	
(7, 2)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The G3 is the principal staff officer for the commander in matters concerning operations, organization, and training. Functions requiring staff organization include the following:</p> <ul style="list-style-type: none"> <li>1) Task organizing and assigning tasks to subordinate elements of the command.</li> <li>2) Exercising coordinating staff supervision over the electronic warfare section.</li> <li>3) Exercising staff supervision over deception activities.</li> <li>4) Exercising staff supervision over rear area protection (RAP) activities including:           <ul style="list-style-type: none"> <li>(a) Planning and coordinating rear area combat operations (RACO) and area damage control (ADC) activities with the ACofS, G2, ACofS, G5, PM, Engineer Staff Officer, and other staff officers and host nation forces as appropriate.</li> <li>(b) Reviewing RAP plans of base commanders to ensure their compatibility with the primary mission of the command and their tactical adequacy.</li> <li>(c) Reviewing ADC plans of subordinate units to ensure their adequacy and to also insure their compatibility with command ADC activities.</li> <li>(d) Organizing ADC control and assessment teams as required.</li> <li>(e) Recommending the composition and size of RAP tactical forces.</li> <li>(f) Preparing the RAP annex to plans and orders.</li> <li>(g) Supervising the rear area operations center (RAOC) (corps level).</li> </ul> </li> </ul>	

Directory 2.2.1 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(7, 3)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The G3 organizes forces for combat operations, intelligence collection, service support, RACO, and ADC.</p> <p>1) General Organization Activities</p> <p>(a) The G3 compiles and maintains the troop list to include continual review and revision to ensure the number and type of units assigned are those that can best accomplish and support the command mission. Recommends the organization and equipping of units to include numbers and types of units to be organized and priority for phase-in or replacement of personnel and equipment in those units. Recommends assignments of attachment of combat, combat support, combat service support units or teams and unit replacements; assigns such units within the command in accordance with requirements of the situation. Receives and processes assigned units or teams.</p> <p>(b) Force structure. Reviews, analyzes, and recommends planned or programmed force.</p> <p>(c) Tactical Troop Movements. The G3 in coordination with G4, the aviation officer, and the transportation officer (division), plans and supervises tactical troop movement to include the selection and designation of combat units.</p> <p>2) Operations Organization</p> <p>(a) The G3 ensures support of operations. Determines effect on operations to minimize interference. Designates forces, area, equipment, and operations requiring priority measures. Counterreconnaissance. Cover and concealment. Task organizing and assigning tasks to subordinate elements of the command.</p> <p>(b) The G3 evaluates vulnerability of combat and combat support troop units, installation, and activities to predicted nuclear fallout. Prepares recommendation for revised task organization or alternate course of action, if required.</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	3) Intelligence Organization	
	(a) The G3 designates combat units for reconnaissance. Plans reconnaissance in force. Coordinates ground reconnaissance with combat patrols and with other combat operations including fires. (G3 air coordinates air-to-surface fires in area of reconnaissance.)	
	(b) The G3 designates units for conduct of surveillance over enemy. Furnishes information on locations of own forces and operation plans. Designates required target characteristics information.	
	(c) The G3 designates combat units for technical intelligence support, including guards.	
	4) Rear Area Organization	
	Exercising staff supervision over rear area protection (RAP) activities including:	
	(a) Planning and coordinating rear area combat operations (RACO) and area damage control (ADC) activities with the ACofS, G2, ACofS, G5, PM, Engineer Staff Officer, and other staff officers and host nation forces as appropriate.	
	(b) Reviewing RAP plans of base commanders to ensure their compatibility with the primary mission of the command and their tactical adequacy.	
	(c) Reviewing ADC plans of subordinate units to ensure their adequacy and to also ensure their compatibility with command ADC activities.	
	(d) Organizing ADC control and assessment teams as required.	
	(e) Recommending the composition and size of RAP tactical forces.	
	(f) Preparing the RAP annex to plans and orders.	
	(g) Supervising the rear area operations center (RAOC) (corps level).	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(7, 5)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The G3 is the principal staff officer for the commander in matters concerning operations, organization, and training. The G3 has primary coordinating staff responsibility for:</p> <ul style="list-style-type: none"> <li>1) Operations           <ul style="list-style-type: none"> <li>(a) Maintaining a current operations estimate of the situation in coordination with other staff officers.</li> <li>(b) Preparing, authenticating, and publishing the overall command SOP with contributions from other staff sections.</li> <li>(c) Preparing, coordinating, authenticating, and publishing operations plans and orders, including tactical movement orders, and reviewing plans and orders of subordinate units.</li> <li>(d) Recommending priorities for allocating critical resources of the command including time, personnel, supplies, and equipment, such as (list is not all inclusive): (1) Ammunition basic loads; (2) Allocation of nuclear and chemical ammunition; (3) Determination of required supply rate (RSR) of ammunition; (4) Determination of the controlled supply rate (CSR) of ammunition for subordinate units; (5) Allocation of electronic frequencies within limitations imposed by control measures (e.g.), Communications-Electronics Operation Instructions (CEOI) and all other means used to control use of frequencies.</li> <li>(e) Task organizing and assigning tasks to subordinate elements of the command.</li> <li>(f) Using resources to accomplish both maneuver and support, including resources used for deception purposes.</li> <li>(g) Coordinating all aspects of maneuver with support (e.g., fires, EW, services), to include other service components (i.e., USAF, USN, USMC) both forward and in</li> </ul> </li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>the rear, including coordination of the use of airspace by all agencies. Representative specific tasks are the following:</p> <ul style="list-style-type: none"> <li>(1) Recommending integrated schemes of tactical maneuver and/or dispositions and fires, including nuclear and chemical fires. <ul style="list-style-type: none"> <li>o Requesting nuclear and chemical release and disseminating notification of release.</li> <li>o Predicting fallout from friendly employment of nuclear weapons.</li> <li>o Predicting downwind hazard from friendly chemical fires.</li> <li>o Disseminating nuclear STRIKEWARN messages as required.</li> </ul> </li> <li>(2) Recommending boundaries and other control measures.</li> <li>(3) Recommending the general locations of command posts.</li> <li>(4) Designating areas for bivouacking, quartering, and staging units.</li> <li>(5) Preparing operational records and reports.</li> <li>(6) Exercising staff supervision over electronic warfare (EW) activities including: <ul style="list-style-type: none"> <li>o Planning and supervising, in coordination with the ACofS, G2, all EW activities in support of tactical operations.</li> <li>o Preparing and coordinating the EW annex to plans and orders.</li> <li>o Determining requirements to support all EW activities.</li> </ul> </li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	<u>DESCRIPTION</u>	LEVEL 3
	<ul style="list-style-type: none"> <li>o Supervising and coordinating with the ACofS, G2 and the communications-electronics (C-E) officer the evaluation of meaconing, interference, jamming, and intrusion (MLJI) reports.</li> <li>o Exercising coordinating staff supervision over the electronic warfare section.</li> <li>o Establishing priority targets for electronic countermeasures (ECM) and publishing control measures.</li> </ul> <p>(7) Exercising staff supervision over operations security (OPSEC) activities including:</p> <ul style="list-style-type: none"> <li>o Supervising and coordinating analysis of the OPSEC posture of the command with the ACofS, G2, the C-E officer, and other staff officers.</li> <li>o Establishing essential elements of friendly information (EEFI).</li> <li>o Determining EEFI and OPSEC vulnerabilities, including nuclear vulnerability assessment analysis and, in coordination with the chemical officer, maintaining the radiation exposure status of the command; recommending troop safety criteria and operation exposure guide; and recommending the appropriate mission-oriented protective posture (MOPP) for the command.</li> <li>o Coordinating evaluation of enemy intelligence threat with the ACofS, G2.</li> <li>o Planning, implementing, and evaluating counter-surveillance operations, countermeasures, and deception requirements.</li> <li>o Coordinating with the C-E officer, implementation of signal security (SIGSEC) measures.</li> </ul> <p>(8) Exercising staff supervision over deception activities including:</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<ul style="list-style-type: none"> <li>o Determining requirements and/or opportunities for deception operations in coordination with the ACofS, G2, and recommending the deception objective.</li> <li>o Recommending the deception story in coordination with the ACofS, G2.</li> <li>o Determining and coordinating deception measures.</li> <li>o Preparing the deception annex to plans and orders.</li> </ul>	
	(9) Exercising staff supervision over rear area protection (RAP) activities including:	
	<ul style="list-style-type: none"> <li>o Planning and coordinating rear area combat operations (RACO) and area damage control (ADC) activities with the ACofS, G2, ACofS, G5, PM, Engineer Staff Officer, and other staff officers and host nation forces as appropriate.</li> <li>o Reviewing RAP plans of base commanders to ensure their compatibility with the primary mission of the command and their tactical adequacy.</li> <li>o Reviewing ADC plans of subordinate units to ensure their adequacy and to also ensure their compatibility with command ADC activities.</li> <li>o Organizing ADC control and assessment teams as required.</li> <li>o Recommending the composition and size of RAP tactical forces.</li> <li>o Preparing the RAP annex to plans and orders.</li> <li>o Supervising the rear area operations center (RAOC) (corps level).</li> <li>o Determining the prescribed nuclear load (PNL) and the prescribed nuclear stockage (PNS)</li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>for all assigned and attached nuclear capable units based on recommendations of the fire support coordinator (FSCOORD).</p> <ul style="list-style-type: none"> <li>o Determining the number of chemical weapons by type to be carried by each assigned and attached delivery unit based on FSCOORD and chemical officer recommendations.</li> </ul> <p>2) Organization</p> <p>(a) Developing and maintaining the troop basis, including review and revision to ensure assignment of the numbers and types of units needed to support and accomplish the mission.</p> <p>(b) Organizing and equipping units; estimating the numbers and types of units to be organized and the priority for phasing in or replacing personnel and equipment in the units.</p> <p>(c) Force Development functions which may include:</p> <p>(1) Force structure. Reviews, analyzes, and recommends planned or programmed force.</p> <p>(2) Manpower allocations. Allocate manpower resources to subordinate commands and within established ceilings and guidance.</p> <p>(3) Tactical Plans</p> <p>The G3 conducts planning to include supervision and coordination of the various supporting plans which become component parts of the overall tactical plan; after command approval, publishes the operation plan or order (OPLAN/OPORD). Provides guidance to other staff officers for preparation of plans. Prepares such alternate operation plans as may be required. Recommends allocation and priorities for personnel, supplies and equipment for combat and combat support units. Establishes the prescribed load for combat and combat support units.</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	(4) Tactical Troop Movements	
	The G3 in coordination with G4, the aviation officer, and the transportation officer (division), plans and supervises tactical troop movement to include the selection and designation of combat units; establishment of priorities; selection of destinations; times of movement; selection of routes; security of the movement; designation of areas for bivouacking, quartering, and as appropriate, staging; preparation of the movement order.	
	3) Miscellaneous Activities.	
	(a) Prediction of fallout for nuclear weapons employed by own forces. The G3 exercises coordinating staff supervision over the predication of fallout from friendly employed nuclear weapons. Incorporates fallout predictions and G2 estimate of the effects of fallout on the area of operation and on enemy capabilities into the operation estimate. Prepares recommendations regarding alternate course of action to be adopted, if required.	
	(b) Signal Communications. The G3 establishes priorities for communications to support tactical operations. Reviews the signal operation plans for communications support of the tactical operations to ensure necessary support in accordance with established priorities.	
	(c) Location of Command Posts. The G3 in coordination with the C-E officer, selects the general location of command posts and affiliated command installations.	
	(d) The G3 provides G4 with requirements for combat service support units.	
	(e) The G3 coordinates use of routes with G4 to ensure tactical and logistical requirements are properly considered. Provides recommendations whenever route has tactical implications; may recommend use of routes be restricted for tactical use only.	
	(f) The G3 provides G4 with requirements for transportation for tactical purposes.	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(7, 6)	See (7, 5) above; potential for direction of forces contained in staff supervision.	
(7, 9)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u></p> <p><u>Representation:</u> The G3 is responsible for recommending priorities for allocating critical resources of the command including time, personnel, supplies, and equipment. The G3 conducts planning to include supervision and coordination of the various supporting plans which become component parts of the overall tactical plan. Recommends allocation and priorities for personnel, supplies and equipment for combat and combat support units. Establishes the prescribed load for combat and combat support units. The G3 integrates fire support into operations. Recommends allocations of nuclear and chemical weapons to subordinate units.</p> <p>The G3 recommends allocation and priorities for equipment and supplies having an impact on the tactical mission. Recommends prescribed loads for equipment and supplies pertaining to the training or tactical mission. Receives the controlled supply rate from the G4; provides G4 with CSR for subordinate commands. Provides G4 with information of anticipated attachments, assignments, or detachments of unit for logistic support planning purposes. Provides G4 with tactical courses of action to assist in determining logistic support tasks. Provides G4 with allocation of nuclear and chemical weapons.</p> <p>1) Allocation of Critical Resources (Examples)</p> <ul style="list-style-type: none"> <li>(a) Ammunition basic loads</li> <li>(b) Allocation of nuclear and chemical ammunition</li> <li>(c) Determination of required supply rate (RSR) of ammunition</li> <li>(d) Determination of the controlled supply rate (CSR) of ammunition for subordinate units.</li> <li>(e) Allocation of electronic frequencies within limitations imposed by control measures (e.g.), Communications-Electronics Operation Instructions (CEOI) and all other means used to control use of frequencies).</li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>(f) Determining the prescribed nuclear load (PNL) and the prescribed nuclear stockage (PNS) for all assigned and attached nuclear capable units based on recommendations of the fire support coordinator (FSCOORD).</p> <p>(g) Determining the number of chemical weapons by type to be carried by each assigned and attached delivery unit based on FSCOORD and chemical officer recommendations.</p> <p>2) Manpower allocations</p> <p>Allocate manpower resources to subordinate commands and within established ceilings and guidance.</p>	
(7, 10)	<p><u>Item:</u> Commanders  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The G3 informs subordinate commanders and the unit commander with specific information and by making recommendations based on estimates and plans developed through his coordination of staff elements.</p> <p>1) Operations</p> <p>(a) Maintaining a current operations estimate of the situation in coordination with other staff officers. Based on the commander's planning guidance and on information received from other staff officers, G3 prepares the operation estimate which culminates in a recommended course of action for accomplishment of the command mission.</p> <p>(b) Preparing, authenticating, and publishing the overall command SOP with contributions from other staff sections.</p> <p>(c) Preparing, coordinating, authenticating, and publishing operations plans and orders, including tactical movement orders, and reviewing plans and orders of subordinate units.</p> <p>(d) Coordinating of all aspects of maneuver with support (e.g., fires, EW, services), to include other service components (i.e., USAF, USN, USMC) both forward and in the rear, including coordination of the use of</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>airspace by all agencies. Representative specific tasks are the following:</p> <ul style="list-style-type: none"> <li>(1) Recommending integrated schemes of tactical maneuver and/or dispositions and fires, including nuclear and chemical fires. <ul style="list-style-type: none"> <li>o Requesting nuclear and chemical release and disseminating notification of release.</li> <li>o Predicting fallout from friendly employment of nuclear weapons.</li> <li>o Predicting downwind hazard from friendly chemical fires.</li> <li>o Disseminating nuclear STRIKEWARN messages as required.</li> </ul> </li> <li>(2) Recommending boundaries and other control measures</li> <li>(3) Recommending the general locations of command posts.</li> <li>(4) Designating areas for bivouacking, quartering, and staging units.</li> <li>(5) Preparing operational records and reports. <ul style="list-style-type: none"> <li>o Determining requirements and/or opportunities for deception operations in coordination with the ACofS, G2, and recommending the deception objective.</li> <li>o Recommending the deception story in coordination with the ACofS, G2.</li> </ul> </li> <li>(6) Exercising staff supervision over rear area protection (RAP) activities including: <ul style="list-style-type: none"> <li>o Planning and coordinating rear area combat operations (RAOO) and area damage control (ADC) activities with the ACofS, G2, ACofS, G5, PM, Engineer Staff Officer, and other staff officers and host nation forces as appropriate.</li> </ul> </li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<ul style="list-style-type: none"> <li>o Reviewing RAP plans of base commanders to ensure their compatibility with the primary mission of the command and their tactical adequacy.</li> <li>o Reviewing ADC plans of subordinate units to ensure their adequacy and to also ensure their compatibility with command ADC activities.</li> <li>o Organizing ADC control and assessment teams as required.</li> <li>o Recommending the composition and size of RAP tactical forces.</li> <li>o Preparing the RAP annex to plans and orders.</li> <li>o Supervising the rear area operations center (RAOC) (corps level).</li> <li>o The G3 compiles and maintains the troop list to include continual review and revision to ensure the number and type of units assigned are those that can best accomplish and support the command mission. Recommends the organization and equipping of units to include numbers and types of units to be organized and priority for phase-in or replacement of personnel and equipment in those units. Recommends assignments of attachment of combat, combat support, combat service support units or teams and unit replacements; assigns such units within the command in accordance with requirements of the situation.</li> </ul> <p>(b) Deception. The G3 determine requirements and/or opportunities for deception and recommends the deception objective. Recommends the deception story.</p> <p>(c) Force structure. Reviews, analyzes, and recommends planned or programmed force.</p>	
2)	Miscellaneous Activities.	
	<p>(a) Prediction of fallout for nuclear weapons employed by own forces. The operation estimate. Prepares</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(7, 11)	<p>recommendations regarding alternate course of action to be adopted, if required</p> <p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The G3 coordinates with virtually all staff elements in order to develop necessary staff products.</p> <p>1) Operations</p> <p>(a) Maintaining a current operations estimate of the situation in coordination with other staff officers.</p> <p>(b) Preparing, authenticating, and publishing the overall command SOP with contributions from other staff sections.</p> <p>(c) Preparing, coordinating, authenticating, and publishing operations plans and orders, including tactical movement orders, and reviewing plans and orders of subordinate units.</p> <p>(d) Coordinating of all aspects of maneuver with support (e.g., fires, EW, services), to include other service components (i.e., USAF, USN, USMC) both forward and in the rear, including coordination of the use of airspace by all agencies. Representative specific tasks are the following: (See (7, 10) Item Commanders for additional detail.)</p> <p>2) Miscellaneous</p> <p>(a) The G4 receives requirements for transport means from G3.</p> <p>(b) The G3 recommends allocation and priorities for equipment and supplies having an impact on the tactical mission. Recommends prescribed loads for equipment and supplies pertaining to the training or tactical mission. Receives the controlled supply rate from the G4; provides G4 with CSR for subordinate commands. Provides G4 with information of anticipated attachments, assignments, or detachments of unit for logistic support planning purposes. Provides G4 with tactical courses of action to assist in determining</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, <u>INTERACTION</u> )	<u>DESCRIPTION</u>	LEVEL 3
	logistic support tasks. Provides G4 with allocation of nuclear and chemical weapons.	
	(c) The G3 may recommend priority of maintenance effort of combat service support units.	
	(d) The G3 provides G4 with requirements for transportation for tactical purposes.	
	(e) The G3 provides G4 with tactical plans and present and future dispositions of tactical units for consideration in locating service units and time of movement.	
	(f) The G3 provides information on tactical plans and concepts as a basis for logistic planning.	
	(g) The G3 provides information on OPLANs which affect the selection of the MRS.	
	(h) The G3 advises on tentative courses of action and recommends EEI on enemy capabilities, vulnerabilities, and characteristics of area of operation (AO) having a major effect on accomplishment of the mission.	
	(i) The G3 shares use of air requests and information nets and spot report receivers. Coordinates with offensive air missions. Recommends basic and front line coverage.	
	(j) G3 makes recommendations as to target characteristics and target development requirements. Evaluates potential targets developed by G2. Makes general target analyses.	
(7, 12)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> The G3 provides information directly to force elements as follows:	
	(1) Disseminating nuclear STRIKEWARN messages as required. (2) Establishing priority targets for electronic countermeasures (ECM) and publishing control measures.	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	(3) Establishes priority targets for electronic countermeasures (ECM).	
(7, 14)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> The G3 shares use of air requests and information nets and spot report receivers. Coordinates with offensive air missions. Recommends basic and front line coverage. The G3 designates combat units for technical intelligence support, including guards. Plans for technical intelligence targets. Receives and requests technical intelligence that may affect operations.	
(7, 15)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> The G3 is responsible for requesting nuclear and chemical release, and disseminating notification of release.	
(8, 3)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Preparing broad planning guidance, policies, and programs for command organizations, operations, and functions.  Developing and maintaining the troop basis, including review and revision to ensure assignment of the numbers and types of units needed to support and accomplish the mission.	
(8, 5)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> The ACoS, security, operations, training, and intelligence has primary coordinating staff responsibility for:  Preparing broad planning guidance, policies, and programs for command organizations, operations, and functions.  Developing and maintaining the troop basis, including review and revision to ensure assignment of the numbers and types of units needed to support and accomplish the mission.	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	Preparing, authenticating, and publishing administrative/logistics plans and orders and operation plans and orders, to include review and integration into the orders those annexes and appendices prepared by other staff officers.	
	Developing policies and guidance for the training of the command and evaluating this training.	
	Coordinating displacements of subordinate commands and assignment of facilities and areas.	
	Exercising staff supervision over all OPSEC activities.	
	Developing broad plans and policies for collecting intelligence and counterintelligence information, directing collection requirements within the command, and disseminating intelligence.	
	Developing policies and reviewing plans for rear area protection (RAP) and physical security.	
	Developing plans and requirements for terrain studies, mapping, and charting.	
	Coordinating the collection and distribution of weather data.	
	Coordinating communications-electronics (C-E) functions of the command.	
	Recommending essential elements of information (EEI).	
	Developing policies and guidance to conduct and control EW and tactical deception functions of the command.	
(8, 6)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Preparing broad planning guidance, policies, and programs for command organizations, operations, and functions.	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(8, 10)	<p><u>Item:</u> Commander  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> Recommending essential elements of information (EEI).</p> <p>Developing policies and guidance to conduct and control EW and tactical deception functions of the command.</p>	
(8, 11)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> Preparing, authenticating, and publishing administrative/logistics plans and orders and operation plans and orders. This includes review and integration into the orders those annexes and appendices prepared by other staff officers.</p> <p>Developing policies and guidance for the training of the command and evaluating this training.</p> <p>Coordinating displacements of subordinate commands and assignment of facilities and areas.</p> <p>Exercising staff supervision over all OPSEC activities.</p> <p>Developing broad plans and policies for collecting intelligence and counterintelligence information, directing collection requirements within the command, and disseminating intelligence.</p> <p>Developing policies and reviewing plans for rear area protection (RAP) and physical security.</p> <p>Developing plans and requirements for terrain studies, mapping, and charting.</p> <p>Coordinating the collection and distribution of weather data.</p> <p>Coordinating communications-electronics (C-E) functions of the command.</p> <p>Recommending essential elements of information (EEI).</p> <p>Developing policies and guidance to conduct and control EW and tactical deception functions of the command.</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(8, 14)	<p><u>Item:</u> Staff  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> Exercising staff supervision over all OPSEC activities.</p>	
(9, -)	See (7, -) above.	
(10, -)	See (8, -) above.	
(11, 3)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The FA support plan is the force artillery commander's tactical plan for employing the fires of all available supporting artillery. The FA operations officer (S3) prepares the FA support plan based on guidance, targets, and instructions included in the fire support plan of the OPORD or by verbal information from the FSE.</p>	
(11, 9)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> The FA support plan ensures the most efficient use of available FA to support the maneuver forces and disseminates the FA commander's guidance on how to accomplish the FA portion of the fire support plan. This guidance may include designation of specific units to attack critical targets that are a threat to the accomplishment of the mission of the supported commander and the manner in which the supporting FA will engage the target.</p>	
(11, 12)	<p><u>Item:</u> Forces  <u>Mechanism:</u>  <u>Factors:</u>  <u>Representation:</u> An FA support plan will contain a written portion, a target list, and the fire support schedules.</p> <p>1) Procedure for Preparing FA Support Plan. The procedure for preparing an FA support plan given in (a) through (h) below applies to division artillery TOCs and DS FA battalion fire direction centers.</p> <p>(a) List the targets received from the planning sources on the target list worksheet and annotate the work columns to reflect the required method of attack,</p>	

Directory 2.2.4 C2 Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>e.g., preparation, counterpreparation, groups, series, and programs.</p> <p>(b) Plot targets on the target overlay and designate other targets as appropriate.</p> <p>(c) Resolve any duplication of targets.</p> <p>(d) Determine the firing unit(s) to attack and the method of attack for each target.</p> <p>(e) Prepare an FA scheduling worksheet for those fires that are to be scheduled, e.g., preparation fire, counterpreparation fire, series of targets, programs of targets, and groups of targets.</p> <p>(f) Annotate the work column(s) on the target list worksheet to reflect the completion of the required action.</p> <p>(g) Prepare the written portion.</p> <p>(h) Extract pertinent data from the target list worksheet and scheduling worksheets and publish the target list and necessary fire support schedules for attachment to the written portion.</p>	
(12, -)	See (7, -) above.	
(13, -)	See (7, -) above.	
(14, 2)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The G4 is the principal staff officer for the commander in matters about supply, maintenance, transportation, and services. Organizes the G4 section to accomplish logistics aspects of mission.	
(14, 3)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The G4 organizes forces in the following manner:	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(14, 5)	<p>1) Determining maintenance workload requirements; assessing the status of maintenance organizations, personnel, and facilities; and coordinating recommendations to the commander in these areas. Planning and coordinating transportation of personnel, equipment, and supplies by all modes of transportation. Determining the adequacy of and recommending employment of logistic support units. Preparing, authenticating, and distributing the administrative/logistics order and coordinating preparation of the service support portions of the operation plan or order.</p> <p>2) Determining supply requirements. Procurement of required supplies by requisition on the base of support or by exploitation of local resources. Provision of control means necessary to coordinate the operations of the supply system.</p> <p>3) Providing required transportation from assigned and attached transportation units, other units of the command, or from that requested and received from higher headquarters.</p> <p>4) Establishing priorities of combat service support units. The G4 prepares general plans for service support to include selection and allocation of combat service support troops by type and number (in coordination with the operations officer).</p> <p>5) Selecting and allocating service troops by type and number required to support the command. The G4 selects service troops by type and number required to support the command (troop planning in coordination with the operations officer, DISCOM or COSCOM).</p> <p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The G4 is the principal staff officer for the commander in matters about supply, maintenance, transportation, and services. The G4, as the logistic planner, must maintain close and continuous coordination with the support command commander who is responsible for logistic support operations. The G4 has primary coordinating staff responsibility for:</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	1) Supply	
	(a) Determining supply requirements. Determination of supply requirements. Procurement of required supplies by requisition on the basis of support or by exploitation of local resources. Receipt, storage, and distribution of supplies to supported forces. Provision of control means necessary to coordinate the operations of the supply system. Maintains information on the status of supplies.	
	(b) Monitoring the requisition, acquisition, storage, and distribution of supplies and equipment and the maintenance of materiel records. The G4 uses incoming requisitions, status reports, and personal or representative liaison to determine present supply need; and considers replacement factors and consumption rates to determine future supply needs. Ensures proper receipt, storage, and distribution of supplies by analyses of areas of operations for terrain considerations, maintaining up to date information of the friendly and enemy situation, keeping himself informed of future plans, and ensuring accurate records of supplies on hand are maintained. Recommends allocations and priorities as determined by consideration of logistic aspects; supervises compliance with allocations and priorities which have been established. Maintains current information on the status of supplies, including nuclear and chemical weapons within and/or available to the command, necessary for the accomplishment of supply activities. Plans for recovery and evacuation of vehicles.	
	(c) 3) Supervising the distribution of weapons, munitions, and equipment according to priorities established by the commander.	
	(d) Supervising the distribution of the controlled supply rate (CSR) or ammunition and its accountability to include publication of CSR in the operation order.	
	(e) Recommending basic loads except class IX prescribed load list, nuclear and chemical.	
	(f) Allocating ground fuels to subordinate units.	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	2) Maintenance	
	The G4 supervises maintenance program of the command. Ensures adequate backup support for maintenance beyond the capability of assigned or attached maintenance units. Approves attachments to subordinate commands and locations to ensure proper distribution of maintenance support capabilities. Recommends evacuation and repair policies. Maintains records of status of maintenance and conducts staff visits and inspections to obtain firsthand information. Provides commander and staff with evaluation of maintenance conditions, an estimate of impact on planned operations, and recommendations for correction or improvement of conditions.	
	(a) Monitoring and analyzing equipment maintenance readiness status.	
	(b) Determining maintenance workload requirements; assessing the status of maintenance organizations, personnel, and facilities; and coordinating recommendations to the commander in these areas.	
	(c) Coordinating with the G3 and recommending maintenance priorities to the commander.	
	(d) Managing the operational readiness float (ORF) equipment.	
	(e) Recommending to the G3 the main supply route (MSR).	
	(f) Preparing logistic estimates, reports, orders, and plans.	
	3) Transportation.	
	(a) Transportation of units, personnel, and supplies by pipeline, water, rail, highway, and air to include operation of carriers. The G4 determines overall transportation requirements of the command. Provides required transportation from assigned and attached transportation units, other units of the command, or from that requested and received from higher headquarters. Coordinates use of all transportation to ensure maximum use of the capacity, consistent with the primary mission activities of the command;	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>consults with the operations officer to determine allocations and priorities for administrative support. Transportation plans include: (i) estimation of requirements and determination of availability, (ii) anticipation of needs and preparation of plans for supply by air, (iii) recommend main supply route (MSR), (iv) furnishing information and instructions to transportation officer regarding detailed transportation planning to include transportation movements.</p> <p>(b) Control of administrative movements to include selection of routes, highway regulation, traffic control, and preparation of movement orders. The G4 is responsible for transportation movements to include selection of routes (in coordination with the G3 for movements when the selection of routes has tactical implications), highway regulation, and traffic control. Plans are formulated in conjunction with detailed plans of the transportation officer and are coordinated with traffic control plans prepared by the Provost Marshal. Approves plans of transportation officer and Provost Marshal pertaining to transportation.</p> <p>(c) Recommending procedures for controlling transportation movements, use of highways, and surface traffic.</p> <p>(e) Preparing instructions about highway regulation, including traffic circulation, routing, and scheduling in coordination with the Provost Marshal.</p>	
4)	Miscellaneous	
	<p>(a) Determining the adequacy of and recommending employment of logistic support units.</p> <p>(b) Identifying requirements for additional logistic support units.</p> <p>(c) Recommending priorities for employment of logistic support units.</p> <p>(d) Recommending the general location of service areas and the movement of logistic support units.</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(14, 6)	<p>(e) Preparation, authentication, and distribution of administrative/logistic plans and orders. The G4 compiles, authenticates, and distributes the administrative/logistic plan or order, paragraph 4 of the OPLAN or OPORD, or the service support annex. Approves all annexes to administrative/logistic orders prepared by other staff officers and pertaining to activities which are a coordinating staff officer responsibility of the G4.</p> <p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The G4 directs forces in the following manner:</p> <ul style="list-style-type: none"> <li>1) Supply           <ul style="list-style-type: none"> <li>(a) Monitoring the requisition, acquisition, storage, and distribution of supplies and equipment and the maintenance of materiel records.</li> <li>(b) Supervising the distribution of weapons, munitions, and equipment according to priorities established by the commander.</li> <li>(c) Supervising the distribution of the controlled supply rate (CSR) or ammunition and its accountability to include publication of CSR in the operation order.</li> <li>(d) Receipt, storage, and distribution of supplies to supported forces. Provision of control means necessary to coordinate the operations of the supply system.</li> </ul> </li> <li>2) Maintenance           <ul style="list-style-type: none"> <li>(a) The G4 supervises maintenance program of the command. Ensures adequate backup support for maintenance beyond the capability of assigned or attached maintenance units. Approves attachments to subordinate commands and locations to ensure proper distribution of maintenance support capabilities. Maintains records of status of maintenance and conducts staff visits and inspections to obtain firsthand information. Monitoring and analyzing equipment maintenance readiness status.</li> </ul> </li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<ul style="list-style-type: none"> <li>(b) Monitoring and analyzing equipment maintenance readiness status.</li> </ul>	
	<p>3) Transportation</p> <ul style="list-style-type: none"> <li>(a) Planning and coordinating transportation of personnel, equipment, and supplies by all modes of transportation.</li> <li>(b) Preparing movement orders for administrative troop movements.</li> <li>(c) Transportation of units, personnel, and supplies by pipeline, water, rail, highway, and air to include operation of carriers.</li> </ul>	
	<p>4) Miscellaneous</p> <ul style="list-style-type: none"> <li>(a) Establishment of priorities of combat service support units. The G4 prepares general plans for service support to include selection and allocation of combat service support troops by type and number (in coordination with the operations officer).</li> <li>(b) Selection and allocation of service troops by type and number required to support the command. The G4 selects and allocates service troops by type and number required to support the command (troop planning in coordination with the operations officer, DISCOM or COSOCOM). Establishes priorities for employment of combat service support units.</li> <li>(c) Managing the operational readiness float (ORF) equipment.</li> </ul>	
(14, 9)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The G4 allocates forces in the following manner:</p> <ul style="list-style-type: none"> <li>1) Recommending basic loads except class IX prescribed load list, nuclear and chemical. Allocating ground fuels to subordinate units.</li> <li>2) Recommends allocations and priorities as determined by consideration of logistic aspects; supervises compliance</li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>with allocations and priorities which have been established. Maintains current information on the status of supplies, including nuclear and chemical weapons within and/or available to the command, necessary for the accomplishment of supply activities.</p> <p>3) Ensures adequate backup support for maintenance beyond the capability of assigned or attached maintenance units. Approves attachments to subordinate commands and locations to ensure proper distribution of maintenance support capabilities.</p> <p>4) Coordinates use of all transportation to ensure maximum use of the capacity, consistent with the primary mission activities of the command; consults with the operations officer to determine allocations and priorities for administrative support.</p> <p>5) Establishment of priorities of combat service support units.</p> <p>6) Selection and allocation of service troops by type and number required to support the command. The G4 selects and allocates service troops by type and number required to support the command (troop planning in coordination with the operations officer, DISCOM or COSCOM).</p>	
(14, 10)	<p><u>Item:</u> Commander</p> <p><u>Mechanisms:</u></p> <p><u>Factors:</u></p> <p><u>Representations:</u> The G4 is the principal staff officer for the commander in matters about supply, maintenance, transportation, and services. The G4, has the logistic planner, must maintain close and continuous coordination with the support command commander who is responsible for logistic support operations.</p> <p>1) Recommending basic loads except Class IX prescribed load list, nuclear and chemical.</p> <p>2) Determining maintenance workload requirements; assessing the status of maintenance organizations, personnel, and facilities; and coordinating recommendations to the commander in these areas.</p> <p>3) Coordinating with the G3 and recommending maintenance priorities to the commander.</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>4) Recommending procedures for controlling transportation movements, use of highways, and surface traffic.</p> <p>5) Determining the adequacy of and recommending employment of logistic support units.</p> <p>(a) Identifying requirements for additional logistic support units.</p> <p>(b) Recommending priorities for employment of logistic support units.</p> <p>(c) Designation of lines for movement and general location for combat service support units. The G4 selects general location of support area. Designates time of movement of service units. Coordinates with DISCOM or COSCOM.</p> <p>6) Recommends evacuation and repair policies. Maintains records of status of maintenance and conducts staff visits and inspections to obtain firsthand information. Provides commander and staff with evaluation of maintenance conditions, an estimate of impact on planned operations, and recommendations for correction or improvement of conditions.</p> <p>7) Selection and allocation of service troops by type and number required to support the command. The G4 selects and allocates service troops by type and number required to support the command (troop planning in coordination with the operations officer, DISCOM or COSCOM).</p> <p>8) Recommending the main supply route (MSR). The G4 based on the tactical and administrative situation, the area of operations, and the enemy situation, recommends the MSR.</p> <p>9) The G4 advises commander and/or G3 on ability to support current and planned operations in his respective field. Plans combat service support operations and adjusts to meet changing tactical situation as provided by G3.</p>	

Directory 2.2.4 C2 Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(14, 11)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The G4 provides information on logistics support to the staff in the following manner:</p> <ul style="list-style-type: none"> <li>1) The G4 advises commander and/or G3 on ability to support current and planned operations in his respective field. Plans combat service support operations and adjusts to meet changing tactical situation as provided by G3. The G4 informs G3 of capability to support the mission, limitations which exist in the logistic field, and recommends which course of action is favored from a logistic viewpoint.</li> <li>2) The G4, based on tactical plan being developed by G3, evaluates impact to provide combat service support; advises G3 of limitations in combat service support which may affect the tactical plan; develops plans to provide required combat service support; recommends to G3 allocations and priorities for combat units. Prepares paragraph 4 of the OPORD and/or service support annex and submits to G3 for inclusion in operation/plan order.</li> <li>3) The G4 submits requirements to G3 for units required to support operations; recommends priority and allocation of assignment of units and personnel and issue of equipment for combat service support units.</li> <li>4) Preparing, authenticating, and distributing the administrative/logistics order and coordinating preparation of the service support portions of the operation plan or order.</li> <li>5) The G4 determines operations effect on logistics activities. Designates area of materiel requiring priority measures.</li> <li>6) The G4 furnishes information concerning the availability of civilian labor to perform the function of guides for reconnaissance units. Provides information from local population to include line crossers, refugees, etc.</li> <li>7) The G4 coordinates evacuation of intelligence materiel. Coordinates use of enemy materiel. Receives</li> </ul>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>and requests technical intelligence that may affect logistic activities.</p> <p>8) G4 advises G2 on tentative EEI relative to logistics considerations for AO.</p> <p>9) The G4 coordinates distribution of EW equipment and supplies, less cryptographic support.</p> <p>10) Maintenance Information</p> <p>(a) Recommends evacuation and repair policies. Maintains records of status of maintenance and conducts staff visits and inspections to obtain firsthand information. Provides commander and staff with evaluation of maintenance conditions, an estimate of impact on planned operations, and recommendations for correction or improvement of conditions.</p> <p>(b) The G4 advises on logistical implications.</p> <p>(c) The G4 coordinates regulated equipment requirements.</p> <p>11) Transportation Information</p> <p>(a) The G3 in coordination with G4, the aviation officer, and the transportation officer (division), plans and supervises tactical troop movement to include the selection and designation of combat units; establishment of priorities; selection of destinations; times of movement; selection of routes; security of the movement; designation of areas for bivouacking quartering, and as appropriate, staging; preparation of the movement order.</p> <p>(b) The G4 receives requirements for transport means from G3. Provides transportation officer with allocation of transportation. Determines priority for movement of combat service support units. Exercises coordinating staff supervision over traffic regulations and traffic control. Ensures that required logistic support is provided. Coordinates with G3 for required security movement.</p> <p>(c) Transportation plans include (i) estimation of requirements and determination of availability, (ii)</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>anticipation of needs and preparation of plans for supply by air, (iii) recommend main supply route (MSR), (iv) furnishing information and instructions to transportation officer regarding detailed transportation planning to include transportation movements.</p> <p>(d) Recommending to the G3 the main supply route (MSR).</p>	
12) Miscellaneous	<p>(a) The G4 recommends location of rear boundary to G3. Reviews recommended location of rear boundary of subordinate units to ensure coordination with the tactical and administrative plan and location of adjacent unit rear boundaries. Recommends approval or disapproval to G3.</p> <p>(b) The G4 estimates the effect the predicted fallout will have on logistic support activities and initiates planning to minimize the effects. Incorporates the fallout prediction and the G2 estimate of the effects of fallout on enemy capabilities and on the area of operations into the continuing staff estimate.</p> <p>(c) The G4 advises on the vulnerabilities of supply, transport, and maintenance facilities and lines of communications.</p> <p>(d) The G4 coordinates logistic support to carry out assigned deception tasks.</p> <p>(e) The G4 provides G3 and FSCORD with specific areas which should be spared from attack by fire support means if tactical situation permits.</p>	
(14, 12)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The G4 informs forces as follows:</p> <p>1) Control of administrative movements to include selection of routes, highway regulation, traffic control, and preparation of movement orders. The G4 is responsible for transportation movements to include selection of</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>routes (in coordination with the G3 for movements when the selection of routes has tactical implications), highway regulation, and traffic control. Plans are formulated in conjunction with detailed plans of the transportation officer and are coordinated with traffic control plans prepared by the Provost Marshal. Approves plans of transportation officer and Provost Marshal pertaining to transportation.</p> <p>2) Receipt, storage, and distribution of supplies to supported forces. Provision of control means necessary to coordinate the operations of the supply system.</p> <p>3) Establishment of priorities of combat service support units. The G4 prepares general plans for service support to include selection and allocation of combat service support troops by type and number (in coordination with the operations officer).</p>	
(14. 13)	<p><u>Item:</u> Commander</p> <p><u>Mechanisms:</u></p> <p><u>Factors:</u></p> <p><u>Representations:</u> The G4 provides required transportation from assigned and attached transportation units, other units of the command, or from that requested and received from higher headquarters.</p>	
(14, 14)	<p><u>Item:</u> Staff</p> <p><u>Mechanisms:</u></p> <p><u>Factors:</u></p> <p><u>Representations:</u> The G4 manages procurement of required supplies by requisition on the base of support or by exploitation of local resources.</p>	
(15, -)	See (14, -) above.	
(16, -)	See (14, -) above.	
(17, 3)	<p><u>Item:</u> Forces</p> <p><u>Mechanism:</u></p> <p><u>Factors:</u></p> <p><u>Representation:</u> Developing policies, plans, and programs for installation and field services functions including transportation (when assigned), NBC decontamination, collection and evacuation of abandoned materiel, real estate acquisition, construction, maintenance, utilities, and firefighting.</p>	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	Developing and recommending the troop basis and The Army Authorization Document System (TAADS) changes pertaining to services functions.	
(17, 6)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Establishing plans, technical training, and technical control of operations of support command units providing installation and field services support.	
(17, 10)	<u>Item:</u> Commander <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Providing advice to the support command commander and staff and assistance to supported and subordinate unit commanders on installation and field services matters.	
(17, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Developing policies, plans, and programs for installation and field services functions including transportation (when assigned), NBC decontamination, collection and evacuation of abandoned materiel, real estate acquisition, construction, maintenance, utilities, and firefighting.  Maintaining liaison with supported and supporting units.	
	Developing estimates and studies of requirements.	
	Developing policies, plans, and programs for supply and maintenance (excluding medical equipment) functions, including supply and maintenance of end items and repair parts, acquisition and collection, salvage and evacuation of unserviceable and excess materiel.	
(18, 5)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> The ACofS, materiel, has primary coordinating staff responsibility for developing policies, plans, procedures, and programs for management and operation of supply and maintenance functions.	

Directory 2.2.4 C<sup>2</sup> Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	Exercising operational control over the materiel management center (MMC).	
	Maintaining liaison with supported and supporting units.	
(18, 6)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Establishing plans, technical training, and technical control of operations of support command units providing supply and maintenance (excluding medical) support.  Monitoring equipment operational readiness rates within the command.	
(18, 9)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Redistribution of supplies and maintenance resources within the command.	
(18, 10)	<u>Item:</u> Commander <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Providing advice to the support command commander and staff and assistance to supported and subordinate unit commanders on supply and maintenance matters.	
(18, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Providing advice to support command commander and staff and assistance to supported and subordinate unit commanders on supply and maintenance matters.	
(18, 14)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Maintaining liaison with supported and supporting units.  Monitoring equipment operational readiness rates within the command.	
(19, -)	Requirements, interactions, and representations are the same as for the Corps Transportation Officer. The ACoS,	

Directory 2.2.4 C2 Coordinating Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	Transportation does not address day-to-day operations in as much detail as the corps and division transportation officers.	
(21, -)	See (17, -) above.	
(22, -)	See (18, -) above.	
(23, -)	See (19, -) above.	

TABLE 2.2.5 C2 SPECIAL STAFF

ITEM	INTERACTION					LEVEL 3									
	ORGANIZE			DIRECT		ALLOCATE		INFORM			REQUEST				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>FIRE SUPPORT</b>															
1 CORPS FSCOORD	*	*	*	*	*	*		*		*	*	*		*	
2 DIVISION FSCOORD	*	*	*	*	*	*		*		*	*	*		*	
3 CORPS ASOC			*					*			*			*	
4 CORPS TACP			*					*			*			*	
5 DIVISION TACP			*					*			*			*	
6 BRIGADE TACP			*					*			*			*	
7 BATTALION TACP			*					*			*			*	
8 CORPS NBCE			*			*		*			*	*			
9 DIVISION NBCE			*			*		*			*	*			
10 BRIGADE FSE			*			*		*			*	*			*
<b>AIR DEFENSE ARTILLERY</b>															
11 CORPS ADA OFFICER		*	*		*			*		*	*				
12 DIVISION ADA OFFICER		*	*		*			*		*	*				
<b>AVIATION</b>															
13 CORPS AVN OFFICER			*		*	*		*		*	*	*			
14 DIVISION AVN OFFICER			*		*	*		*		*	*	*			
<b>COMMUNICATIONS-ELECTRONICS</b>															
15 CORPS C-E OFFICER			*		*	*		*		*	*	*			
16 DIVISION C-E OFFICER			*		*	*		*		*	*	*			
<b>CHEMICAL</b>															
17 CORPS CHEM OFFICER			*		*	*		*		*	*	*			
18 DIVISION CHEM OFFICER			*		*	*		*		*	*	*			
<b>ENGINEER</b>															
19 CORPS ENGR OFFICER	*	*	*		*	*	*	*		*	*	*			
20 DIVISION ENGR OFFICER	*	*	*		*	*	*	*		*	*	*			
<b>OTHER</b>															
21 CORPS SWO										*					
22 DIVISION SWO										*					
23 CORPS TRANS OFFICER			*	*		*		*			*	*			
24 DIVISION TRANS OFFICER			*	*		*		*			*	*			

COMMANDERS  
STAFF FORCES

Directory 2.2.5 C2 Special Staff

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(1, 1)	<p><u>Item:</u> Commander  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Organizes and supervises the fire support elements (FSEs), fire support sections (FSSs), and fire support teams (FISTS) with supported units down to and including company and troop.</p>	
(1, 2)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Organizes and supervises the fire support elements (FSEs), fire support sections (FSSs), and fire support teams (FISTS) with supported units down to and including company and troop.</p>	
(1, 3)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Recommends the field artillery task organization.</p>	
(1, 4)	<p><u>Item:</u> Commander  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The field artillery commander is designated the fire support coordinator (FSCOORD). In smaller units, brigades, or separate task forces, the FSCOORD usually is the commanding officer or his representative from the attached or supporting field artillery unit. In the absence of an attached or supporting field artillery unit, the situation may require that the commander designate a FSCOORD for coordination of available fire support. Organizes and supervises the fire support elements (FSEs), fire support sections (FSSs), and fire support teams (FISTS) with supported units down to and including company and troop.</p>	
(1, 5)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The FSCOORD directs the FSE staff as follows:</p> <ol style="list-style-type: none"> <li>1) Assists in the preparation of operation plans and orders by providing information pertinent to fire support organizations and operations to include recommending fire support coordination measures and priorities. Supervises</li> </ol>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>the preparation of the fire support annex and supporting appendixes.</p> <p>2) Provides for target analysis and damage assessment of nuclear and chemical weapons employed on surface targets by friendly field artillery.</p> <p>3) Coordinates field artillery survey within the command and with higher and adjacent commands.</p> <p>4) Provides technical assistance to the ACoS, G2, in the study and evaluation of enemy fire support capabilities and supports the battlefield surveillance plan.</p> <p>5) Coordinates field artillery target acquisition within the command and with higher and adjacent commands.</p> <p>6) Organizes and supervises the fire support elements (FSEs), fire support sections (FSSs), and fire support teams (FISTS) with supported units down to and including company and troop.</p> <p>7) Coordinates efforts to suppress enemy air defense with fire support means, as appropriate.</p>	
(1, 6)	<p><u>Item:</u> Forces</p> <p><u>Mechanisms:</u></p> <p><u>Factors:</u></p> <p><u>Representations:</u> Organizes and supervises the fire support elements (FSEs), fire support sections (FSSs), and fire support teams (FISTS) with supported units down to and including company and troop.</p>	
(1, 9)	<p><u>Item:</u> Forces</p> <p><u>Mechanisms:</u></p> <p><u>Factors:</u></p> <p><u>Representations:</u> Recommends the allocation of nuclear and chemical weapons for fire support operations; also recommends the prescribed nuclear load for field artillery units, subordinate units, supply points, and depots, as appropriate.</p>	
(1, 10)	<p><u>Item:</u> Commander</p> <p><u>Mechanisms:</u></p> <p><u>Factors:</u></p> <p><u>Representations:</u> The FSCOORD informs commanders as follows:</p>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<ul style="list-style-type: none"> <li>1) Advises on fire support on surface targets, target acquisition, radar emplacement, counterfire operations, and deception operations by fire support means.</li> <li>2) Provides information on the status of field artillery fire support means.</li> <li>3) Recommends use of fire support means from other services and advises liaison representatives from supporting services.</li> </ul>	
(1, 11)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The FSCOORD informs the staff as follows:</p> <ul style="list-style-type: none"> <li>1) Provides information on the status of field artillery ammunition on hand, recommends to the ACofS, G3, the field artillery ammunition required supply rate (RSR), provides an estimate of the adequacy of the field artillery ammunition controlled supply rate (CSR), and recommends the CSR for subordinate commands.</li> <li>2) The G3 integrates fire support into operations. Receives the fire support plan from the FSCOORD; reviews to ensure that it is in consonance with command guidance and is compatible with the planned scheme of defense; integrates the fire support plan into the OPLAN/OPORD as the fire support annex. Recommends allocations of nuclear and chemical weapons to subordinate units. Determines the prescribed nuclear load (PNL) and the prescribed nuclear stockage (PNS) for all assigned and attached nuclear capable units based on FSCOORD recommendations. Determines the number of chemical weapons by type to be carried by each assigned and attached delivery unit based on FSCOORD and chemical officer recommendations.</li> <li>3) FSCOORD submits requirements for combat and combat support units to G3; recommends priority and allocation of assignment of combat support units and personnel and issue of equipment. Submits requirements for combat service support units to appropriate coordinating staff officers. Recommends to appropriate coordinating staff officer priority and allocation of assignment of units and personnel and issue of equipment for fire support.</li> </ul>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	4) Provide G3 with advice concerning availability and capability of combat support means and make general recommendations concerning employment of such means.	
	5) FSCOORD coordinates suppression of artillery fires in area of reconnaissance, target marking, and SEAD fires, as required. Provides observer personnel as required. Uses photos to obtain survey data and verify target locations.	
	6) Recommend to G3 allocation and priorities of personnel supplies and equipment to combat and combat support units of the command. Assists G3 in planning, as required, to include preparation of specific plans for employment of combat support means and preparation of portions of the overall plan.	
	7) Submits to the G2 information and intelligence derived from field artillery operations.	
	8) FSCOORD provides supporting and interdiction fires. Provides forward observer personnel. Coordinates surface-to-surface fires in area of reconnaissance.	
	9) FSCOORD requests information on physical characteristics of target required for target analyses. Informs G2 of combat surveillance information received from artillery and other sources.	
	10) FSCOORD makes detailed target analysis and furnishes target information. Furnishes and receives information of enemy troops, materiel, supply, installations, training, tactics, and capabilities. Assists in evaluating information.	
	11) Estimates the effect the predicted fallout will have on troop units, installations, and activities in their respective areas, advises appropriate coordinating staff officer, initiates planning to minimize effects.	
	12) Advises appropriate coordinating staff officer on ability to support operations and on the impact of current and planned operations in their respective fields.	
	13) FSCOORD provides chemical officer with necessary data to predict fallout; receives predicted fallout from chemical officer, includes such information in recommendations to G3 for employment of nuclear weapons.	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	<u>DESCRIPTION</u>	LEVEL 3
(1, 12)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The FSCOORD informs forces as follows:</p> <ul style="list-style-type: none"> <li>1) Advises on fire support on surface targets, target acquisition, radar emplacement, counterfire operations, and deception operations by fire support means.</li> <li>2) Coordinates field artillery survey within the command and with higher and adjacent commands.</li> <li>3) Organizes and supervises the fire support elements (FSEs), fire support sections (FSSs), and fire support teams (FISTS) with supported units down to and including company and troop.</li> </ul>	
(1, 14)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Requests from the FSCOORD include the following:</p> <ul style="list-style-type: none"> <li>1) FSCOORD requests information on physical characteristics of target required for target analyses. Informs G2 of combat surveillance information received from artillery and other sources.</li> <li>2) FSCOORD requests technical intelligence of target characteristics.</li> <li>3) FSCOORD submits requirements for combat and combat support units to G3; recommends priority and allocation of assignment of combat support units and personnel and issue of equipment. Submits requirements for combat service support units to appropriate coordinating staff officers. Recommends to appropriate coordinating staff officer priority and allocation of assignment of units and personnel and issue of equipment for field artillery.</li> </ul>	
(2, -)	See (1, -) above.	
(3, -)	See (4, -) below. The corps ASOC contains the corps TACP which provides the major functions for the ASOC.	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(4, 3)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Assisting the corps G3 plans in preparing portions of plans and orders dealing with tactical air support, to include the air support appendix of the fire support annex to the corps oplan.	
(4, 9)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Advising the corps staff on tactical air support employment, and resources, to include capabilities and limitations.	
(4, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Assisting in planning and requesting tactical air support, to include close air support, battlefield air interdiction, reconnaissance, and airlift. Coordinating the integration of other support means with air missions to include requesting suppression of enemy air defenses (SEAD) support.	
(4, 15)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Preparing, reviewing, and forwarding immediate tactical air support requests to the ASOC.	
(5, -)	See (4, -) above.	
(6, -)	See (4, -) above.	
(7, -)	See (4, -) above.	
(8, 3)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> <ol style="list-style-type: none"> <li>1) Planning, controlling, and coordinating nuclear, biological, and chemical monitoring and surveys.</li> <li>2) Assisting in planning the use of nuclear and chemical weapons.</li> </ol>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	<u>DESCRIPTION</u>	LEVEL 3
	3) Planning and recommending requirements for the use of the NBC defense company and other attached chemical units.	
	4) Advising on smoke operations in coordination with the G3.	
(8, 9)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> <ul style="list-style-type: none"> <li>1) Planning and supervising measures to avoid or reduce effects of enemy NBC attacks.</li> <li>2) Planning and recommending requirements for the use of the NBC defense company and other attached chemical units.</li> <li>3) Assisting in planning the use of nuclear and chemical weapons.</li> <li>4) Preparing the NBC defense annex to plans and orders.</li> </ul>	
(8, 10)	<u>Item:</u> Commander <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> <ul style="list-style-type: none"> <li>1) Advising on the impact of NBC contamination on tactical and logistical operations.</li> <li>2) Advising on the implementation of MOPP.</li> </ul>	
(8, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> <ul style="list-style-type: none"> <li>1) Receiving, processing, evaluating, and disseminating nuclear, biological, and chemical monitoring and survey data.</li> <li>2) Preparing detailed fallout predictions for enemy nuclear weapons.</li> <li>3) Preparing chemical vapor hazard predictions for enemy chemical attacks.</li> </ul>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	<u>DESCRIPTION</u>	LEVEL 3
	<ul style="list-style-type: none"> <li>4) Preparing and disseminating warning messages for friendly chemical strikes.</li> <li>5) Collation, evaluation, and distribution of NBC contamination data.</li> <li>6) Collection of NBC contamination information in conjunction with higher, lower, and adjacent units.</li> <li>7) Planning and supervising chemical target analysis.</li> <li>8) Receipt, collation, evaluation, preparation and distribution of NBC reports.</li> <li>9) Effective wind-message preparation and dissemination.</li> <li>10) Maintaining the NBC situation map and overlays.</li> <li>11) Advising the G2 on NBC intelligence matters.</li> </ul>	
(9, -)	See (8, -) above.	
(10, 3)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> <ul style="list-style-type: none"> <li>1) Developing the fire support plan and coordinating its implementation, to include nuclear and chemical fires.</li> <li>2) Recommending field artillery organization for combat.</li> </ul>	
(10, 6)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> <ul style="list-style-type: none"> <li>1) Developing the fire support plan and coordinating its implementation, to include nuclear and chemical fires.</li> <li>2) Planning and coordinating fire support suppression of enemy air defenses (SEAD).</li> </ul>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(10, 9)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> <ul style="list-style-type: none"> <li>1) Recommending field artillery organization for combat.</li> <li>2) Developing the fire support plan and coordinating its implementation, to include nuclear and chemical fires.</li> </ul>	
(10, 10)	<u>Item:</u> Commander <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Advising the commander on adequacy of fire support for the operation being conducted.	
(10, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> <ul style="list-style-type: none"> <li>1) Advising on all fire support matters.</li> <li>2) Maintaining a current status of all fire support means available to the force, to include field artillery, air support, and naval gunfire.</li> <li>3) Recommending target priorities for fire support.</li> </ul>	
(10, 15)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representation:</u> Expediting immediate fire support needs and requests for additional fire support from subordinate units and commanders.	
(11, 2)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representation:</u> Determines requirements for ADA units and recommends their allocation to subordinate units and recommends the command relationships between the subordinate units and supporting ADA units.	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(11, 3)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Prepares the ADA portion of plans and orders.	
(11, 5)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The ADA officer directs the staff as follows: <ol style="list-style-type: none"> <li>1) Prepares the ADA portion of plans and orders.</li> <li>2) Ensures coordination of Army ADA operations within the force and with area and regional AD commands, AD elements of other services, and allies in the area of operations.</li> <li>3) Plans and coordinates the use of airspace in conjunction with the aviation officer.</li> <li>4) Monitors the readiness status of ADA units and advises the commander and appropriate staff elements on associated maintenance problems.</li> </ol>	
(11, 9)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The ADA officer determines requirements for ADA units and recommends their allocation to subordinate units and the command relationships between the subordinate units and supporting ADA units.	
(11, 10)	<u>Item:</u> Commander <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The ADA officer informs the commander as follows: <ol style="list-style-type: none"> <li>1) Advises the commander and staff on all matters related to the employment of ADA units.</li> <li>2) Plans and coordinates the use of airspace in conjunction with the aviation officer.</li> <li>3) Monitors the readiness status of ADA units and advises the commander and appropriate staff elements on associated maintenance problems.</li> </ol>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(11, 11)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The ADA officer informs the staff as follows:</p> <ul style="list-style-type: none"> <li>1) Plans and coordinates the use of airspace in conjunction with the aviation officer.</li> <li>2) Monitors the readiness status of ADA units and advises the commander and appropriate staff elements on associated maintenance problems.</li> <li>3) Prepares the ADA portion of the command SOP.</li> <li>4) Coordinates with the G2 the integration of ADA operations into the overall intelligence system.</li> <li>5) Estimates air threat for G2.</li> <li>6) Furnishes and receives information of enemy troops, materiel, supply, installations, training, tactics, and capabilities in ADA areas of interest. Assists in evaluating information.</li> <li>7) Provides G3 with advice concerning availability and capability of combat support means to make general recommendations concerning employment of such means.</li> <li>8) Provides advice and recommendations concerning employment of combat support means within ADA. Recommends to G3 allocation and priorities of personnel supplies and equipment to combat and combat support units of the command. Assists G3 in planning, as required, to include preparation of specific plans for employment of ADA combat support means and preparation of portions of the overall plan.</li> <li>9) Submits requirements for combat and combat support units to G3; recommend priority and allocation of assignment of combat support units and personnel and issue of equipment. Submits requirements for combat service support units to appropriate coordinating staff officers. Recommends to appropriate coordinating staff officer priority and allocation of assignment of units and personnel and issue of equipment for ADA.</li> </ul>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

<u>(ITEM, INTERACTION)</u>	<u>DESCRIPTION</u>	<u>LEVEL 3</u>
	10) Prepares necessary annexes for approval and authentication.	
(12, -)	See (11, -) above.	
(13, 3)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Assists in the planning and supervision of the following Army aviation operations: <ol style="list-style-type: none"> <li>1) Employment of aviation in combat and combat support operations.</li> <li>2) Establishment and operation of the air-space management and air traffic control systems.</li> </ol>	
(13, 5)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Assists in the planning and supervision of the following Army aviation operations: <ol style="list-style-type: none"> <li>1) Employment of aviation in combat and combat support operations.</li> <li>2) Establishment and operation of the air-space management and air traffic control systems.</li> <li>3) Exercise staff supervision over technical and flight aspects of Army aviation operations.</li> </ol>	
(13, 6)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Assists in the planning and supervision of the following Army aviation operations: <ol style="list-style-type: none"> <li>1) Employment of aviation in combat and combat support operations.</li> <li>2) Establishment and operation of the air-space management and air traffic control systems.</li> </ol>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(13, 9)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Prepares the aviation portion of plans and orders.</p>	
(13, 11)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Prepares the aviation portion of plans and orders and with the ADA officer and other appropriate agencies, assists in developing the airspace management plan. Coordinates with the transportation and movements staff personnel in matters requiring Army aircraft for combat service support operations and other administrative flight operations deemed necessary. Assists the staff in preparing aviation portions of estimates, plans, orders, and reports. Specific information includes the following:</p> <ul style="list-style-type: none"> <li>1) AVN provides data on air threat.</li> <li>2) AVN assigns missions. Coordinates priorities on use of Army aviation. Furnishes technical advice on use of Army aviation.</li> <li>3) AVN furnishes Army aviation for photo delivery for G2. Coordinates with Army aviation operations.</li> <li>4) AVN provides Army aviation for photography and visual observation for G2.</li> <li>5) Furnishes and receives information of enemy troops, materiel, supply, installations, training, tactics, and capabilities. Assists in evaluating information.</li> <li>6) AVN provides air observation of effectiveness of camouflage and concealment for G4.</li> <li>7) Estimates the effect the predicted fallout will have on AVN operations; submits appropriate recommendations to coordinating staff officer concerned, and initiates planning to minimize effects.</li> <li>8) Submits requirements for combat and combat support units to G3; recommend priority and allocation of assignment of combat support units and personnel and issue of equipment. Submits requirements for combat service</li> </ul>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>support units to appropriate coordinating staff officers. Recommends to appropriate coordinating staff officer priority and allocation of assignment of units and personnel and issue of equipment.</p> <p>9) AVN provides special staff assistance in the planning and use of Army aviation for delivery of supplies and equipment by air.</p> <p>10) Prepare necessary annexes for approval and authentication.</p>	
(13, 12)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Airspace management constraints information, mission tasking.</p>	
(14, -)	See (13, -) above.	
(15, 3)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The C-E officer determines the methods to provide communications-electronics support to satisfy command requirements, including the employment of signal troops.</p>	
15, 5)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The C-E officer:</p> <p>1) Prepares and exercises staff supervision over electronic counter-countermeasure (ECCM) portion of the training program.</p> <p>2) Assists in the preparation of EW plans and annexes.</p>	
(15, 6)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The C-E officer plans and supervises operations concerning the following:</p> <p>1) Installation, operation, and maintenance of signal communications systems by assigned or attached signal units.</p>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

<u>(ITEM, INTERACTION)</u>	<u>DESCRIPTION</u>	<u>LEVEL 3</u>
	2) Still and motion-picture photographic services, except air photography.	
(15, 9)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The C-E officer coordinates frequency allocation, frequency assignment and use, and the reporting and processing of meaconing, interference, jamming, and intrusion (MLJI) problems.	
(15, 10)	<u>Item:</u> Commander <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The C-E officer advises on all C-E matters, including location of headquarters, location of C-E facilities, and use of signal activities for deception. Coordinates frequency allocation, frequency assignment and use, and the reporting and processing of meaconing, interference, jamming, and intrusion (MLJI) problems.	
(15, 11)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The C-E officer informs the staff as follows: <ol style="list-style-type: none"> <li>1) C-E based on G3 guidance, develops plan for establishing signal communications. Prepares C-E annex to operation order. Coordinates restricted frequency list and disseminates taboo and protected frequency lists; submits to G3 for approval.</li> <li>2) Recommends to G3 allocation and priorities of personnel supplies and equipment to combat and combat support units of the command. Assists G3 in planning, as required, to include preparation of specific plans for employment of support means and preparation of portions of the overall plan.</li> <li>3) C-E provides C-E input to EW annex. Implements defensive EW policy and procedures.</li> <li>4) C-E provides advice and implements signal security (SIGSEC) measures.</li> <li>5) C-E provides C-E support to the deception plan.</li> </ol>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

<u>(ITEM, INTERACTION)</u>	<u>DESCRIPTION</u>	<u>LEVEL 3</u>
	6) Coordinates frequency allocation, frequency assignment and use, and the reporting and processing of meaconing, interference, jamming, and intrusion (MIJI) problems.	
	7) Supervising and coordinating with the ACofS, G2 and the communications-electronics (C-E) officer the evaluation of meaconing, interference, jamming, and intrusion (MIJI) reports. Provides G2 information on communications and electronic intelligence. C-E provides communications and ground photography, as required. C-E reproduces and distributes airphotos. Coordinates in establishing priorities for photographic support. Delivers air photos. Furnishes and receives information of enemy troops, materiel, supply, installations, training, tactics, and capabilities in their respective areas of interest. Assists in evaluating information.	
	8) Advises on all C-E matters, including location of headquarters, location of C-E facilities, and use of signal activities for deception. C-E advises G3 on signal communications aspect of location; recommends site.	
	9) C-E provides signal considerations in the location of the rear boundary.	
	10) Advises appropriate coordinating staff officer on ability to support operations and on the impact of current and planned operations in their respective fields.	
	11) Estimates the effect the predicted fallout will have on communications operations, submits appropriate recommendations to coordinating staff officer concerned, and initiates planning to minimize effects.	
	12) Submits requirements for combat and combat support units to G3; recommends priority and allocation of assignment of combat support units and personnel and issue of equipment. Submits requirements for combat service support units to appropriate coordinating staff officers. Recommends to appropriate coordinating staff officer priority and allocation of assignment of units and personnel and issue of equipment.	
	13) C-E provides communications needed for traffic control that are beyond capability of units concerned.	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(15, 12)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The C-E officer coordinates frequency allocation, frequency assignment and use, and the reporting and processing of meaconing, interference, jamming, and intrusion (MIJI) problems.</p>	
(16, -)	See (15, -) above.	
(17, 3)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Assists in planning the use of nuclear and chemical weapons.</p>	
(17, 5)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Prepares the nuclear, biological, and chemical (NBC) portion of plans and orders.</p>	
(17, 6)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Directs and coordinates chemical operations and radiological aspects of nuclear weapon employment with other combat support and combat service support operations.</p>	
(17, 9)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Assists in planning the use of nuclear and chemical weapons.</p>	
(17, 10)	<p><u>Item:</u> Commander  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Advises the commander and staff on matters concerning offensive and defensive chemical operations. Assists in planning the use of nuclear and chemical weapons.</p>	
(17, 11)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u></p>	

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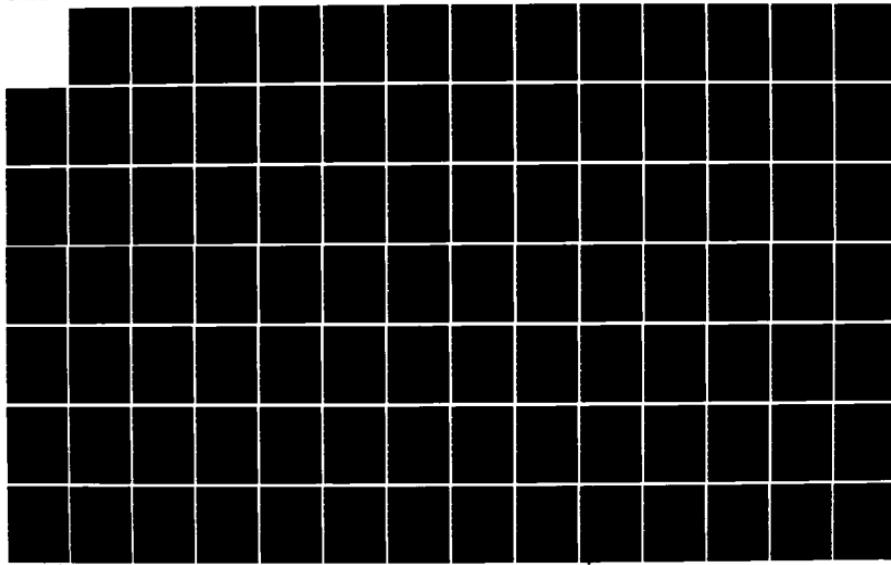
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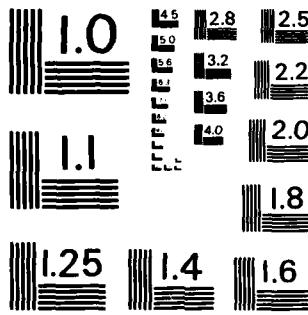
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Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p><u>Representations:</u> Advises the commander and staff on matters concerning offensive and defensive chemical operations as follows:</p> <p>1) Prepares the nuclear, biological, and chemical (NBC) portion of plans and orders. Advises G3 on allocation and use of chemical means, submits to FSCOORD for review and for incorporation into fire support plan. Prepares fallout predictions as required for nuclear attacks. Provides G3 with technical data necessary to develop vulnerability of friendly forces to fallout. Develops plan for monitoring fallout from friendly delivered nuclear weapons. FSCOORD provides chemical officer with necessary data to predict fallout; receives predicted fallout from chemical officer, includes such information in recommendations to G3 for employment of nuclear weapons.</p> <p>2) Provide G3 with advice concerning availability and capability of combat support means and make general recommendations concerning employment of such means. Submit requirements for combat and combat support units to G3; recommend priority and allocation of assignment of combat support units and personnel and issue of equipment. Submit requirements for combat service support units to appropriate coordinating staff officers. Recommend to appropriate coordinating staff officer priority and allocation of assignment of units and personnel and issue of equipment for nuclear chemical operations. CML advises on capability to provide smoke concealment; plans provided as directed</p> <p>(a) The G3 determines the number of chemical weapons by type to be carried by each assigned and attached delivery unit based on FSCOORD and chemical officer recommendations.</p> <p>(b) The G3 determines EEFI and OPSEC vulnerabilities, including nuclear vulnerability assessment analysis and, in coordination with the chemical officer, maintaining the radiation exposure status of the command; recommending troop safety criteria and operation exposure guide; and recommending the appropriate mission-oriented protective posture (MOPP) for the command.</p>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>3) General information includes the following:</p> <ul style="list-style-type: none"> <li>(a) Chemical and nuclear target analysis and munition requirement computation, as required in coordination with the FSCOORD.</li> <li>(b) Receipt, collation, evaluation, preparation, and distribution of nuclear, biological, and chemical reports.</li> <li>(c) Provides information on contaminated areas.</li> <li>(d) Prepares fallout predictions, provides expert information on nuclear effects. Coordinates NBC warning and reporting system throughout the NBCE.</li> <li>(e) Furnishes and receives information of enemy troops, materiel, supply, installations, training, tactics, and capabilities for NBC employment. Assists in evaluating information.</li> <li>(f) Advises on impact of weather on nuclear and chemical operations. Prepares and disseminates the effective downwind message.</li> <li>(g) Provides screening agents.</li> <li>(h) Advises on contaminated areas and impact on transportation operations.</li> </ul>	
(17, 12)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> The chemical officer informs forces as follows:</p> <ul style="list-style-type: none"> <li>1) Specifies smoke operations, including coordination with the ACofS, G3, or ACofS, security, operations, training, and intelligence.</li> <li>2) Provides data on the casualty-producing effectiveness and the degree of downwind hazard from friendly chemical attacks.</li> <li>3) Provides collation, evaluation, and distribution of NBC contamination data.</li> </ul>	
(18, -)	See (17, -) above.	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
(19, 1)	<p><u>Item:</u> Commander  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Determines the requirements for engineer support, recommends the allocation of engineer resources to subordinate units to include the command or support relationships between subordinate units and supporting engineers, and exercises staff supervision over all engineer actions in support of the command.</p>	
(19, 2)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Determines the requirements for engineer support, recommends the allocation of engineer resources to subordinate units to include the command or support relationships between subordinate units and supporting engineers, and exercises staff supervision over all engineer actions in support of the command.</p>	
(19, 3)	<p><u>Item:</u> Forces  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Determines the requirements for engineer support, recommends the allocation of engineer resources to subordinate units to include the command or support relationships between subordinate units and supporting engineers, and exercises staff supervision over all engineer actions in support of the command.</p>	
(19, 4)	<p><u>Item:</u> Commander  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> At division and corps is the commander of the assigned engineer unit. In smaller units (maneuver brigades, battalion, or separate task forces), the engineer can be the commanding officer of the attached, operational control (OPOCON), or supporting engineer unit if a specifically designated engineer has not been provided. Plans and supervises lower echelon engineer operations pertaining to mobility, countermobility, survivability, etc.</p>	
(19, 5)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Plans and supervises engineer operations pertaining to the following:</p>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<ol style="list-style-type: none"> <li>1) Mobility: Construction, rehabilitation, and emergency repair of roads, bridges, and combat trails; breaching of minefields, and reduction or bypass of obstacles to enhance or preserve the mobility of friendly forces.</li> <li>2) Countermobility: Construction of obstacles, demolitions, and mine warfare to counter the mobility of enemy forces.</li> <li>3) Survivability: Construction of fortifications, protective shelters, and weapons emplacements to increase the survivability of weapons systems, personnel, supplies, equipment, and facilities.</li> <li>4) General engineering and construction to support deployed forces.</li> <li>5) Airfield construction and damage repair.</li> <li>6) Classification of roads, bridges, and airfields.</li> <li>7) Denial operations.</li> <li>8) Employment of atomic demolition munitions.</li> <li>9) Construction and placement of deception devices.</li> <li>10) Engineer reconnaissance.</li> <li>11) Prepares the engineer portion of plans and orders to include the engineer annex and supporting appendixes (e.g., obstacles, atomic demolition conditions).</li> <li>12) Conducts terrain and trafficability studies.</li> </ol>	
(19, 6)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Directs lower echelon units in engineer operations.	
(19, 8)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Determines the requirements for engineer support, recommends the allocation of engineer resources to subordinate units to include the command or support	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	relationships between subordinate units and supporting engineers, and exercises staff supervision over all engineer actions in support of the command.	
(19, 9)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Determines the requirements for engineer support, recommends the allocation of engineer resources to subordinate units to include the command or support relationships between subordinate units and supporting engineers, and exercises staff supervision over all engineer actions in support of the command.	
(19, 10)	<u>Item:</u> Commander <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Determines the requirements for engineer support, recommends the allocation of engineer resources to subordinate units to include the command or support relationships between subordinate units and supporting engineers, and exercises staff supervision over all engineer actions in support of the command.	
(19, 11)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The engineer officer informs the staff in the following manner: <ol style="list-style-type: none"> <li>1) Prepares the engineer portion of plans and orders to include the engineer annex and supporting appendixes (e.g., obstacles, atomic demolition conditions).</li> <li>2) Provide advice and recommendations to G3 concerning employment of engineer combat support means. Recommend to G3 allocation and priorities of personnel supplies and equipment to combat and combat support units of the command. Assist G3 in planning, as required, to include preparation of specific plans for employment of engineer combat support means and preparation of portions of the overall plan.</li> <li>3) Engineer advises G3 of requirements for support of engineer operations and impact of planned fire support on engineering operations. Recommends and develops plans for</li> </ol>	

Directory 2.2.5 C2 Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>employment of scatterable mines and atomic demolition munitions.</p> <p>4) Engineer provides G3 with road and bridge capabilities; recommends routes.</p> <p>5) Submit to G3 signal communications requirements.</p> <p>6) Conducts terrain and trafficability studies. Engineer uses photos to obtain information and produce terrain intelligence.</p> <p>7) Furnishes and receives information from G2 concerning enemy troops, materiel, supply, installations, training, tactics, and capabilities. Assists in evaluating information.</p> <p>8) Advise appropriate coordinating staff officer on ability to support operations and on the impact of current and planned operations on engineer operations.</p> <p>9) Estimate the effect the predicted fallout will have on engineer operations, submit appropriate recommendations to coordinating staff officer concerned, and initiate planning to minimize effects.</p> <p>10) Engineer provides G4 with engineer road maintenance considerations in the location of the rear boundary.</p> <p>11) Engineer provides tonnage capabilities of roads and bridges; recommends limitations on use of roads (one-way or two-way); provides signs for posting restrictions or directions.</p> <p>12) Engineer makes route reconnaissance, provides engineer technical advice, makes recommendation as to selection of MSR.</p> <p>13) Prepare necessary annexes for approval and authentication.</p>	

(19, 12)      Item: Forces  
Mechanisms:  
Factors:  
Representations: Exercises staff supervision over all engineer actions in support of the command

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

<u>(ITEM, INTERACTION)</u>	<u>DESCRIPTION</u>	<u>LEVEL 3</u>
(20, -)	See (19, -) above.	
(21, 11)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The staff weather officer provides the following: <ol style="list-style-type: none"> <li>1) SWO provides weather information for trafficability and intervisibility estimates.</li> <li>2) SWO provides weather input to collection management.</li> <li>3) SWO furnishes wind, stability, and precipitation forecasts for use in determining fallout pattern.</li> <li>4) SWO provides G3 with weather information.</li> <li>5) SWO provides information concerning effects of weather on communications.</li> <li>6) Recommends to appropriate coordinating staff officer priority and allocation of assignment of units and personnel and issue of equipment in support of weather operations.</li> <li>7) Prepare necessary annexes for approval and authentication.</li> </ol>	
(22, 11)	See (21, 11) above.	
(23, 2)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> Organizing the transportation staff to support the development of policies, plans, and programs for transportation functions. Recommending training, allocations, and priorities for support command personnel and units engaged in transportation functions.	
(23, 3)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The transportation officer supports organization of forces as follows:	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>1) Planning, in coordination with the Air Force and the Navy, for use of these Services' transportation for Army movements and for use of Army transportation for their movements.</p> <p>2) Planning, in coordination with the ACoFS, GS, and host or allied nations for use of their transportation for U.S. forces and for their support by Army transportation. This includes support of CMO and use of allocated national and local commercial transportation capabilities and facilities. Coordinating the command's transportation plans with higher, lower, and adjacent headquarters, as required.</p> <p>3) Making plans and recommendations, in coordination with the command's aviation officer, for employment of Army air transport capability in combat support and combat service support operations, to include use of airspace and air traffic control procedures.</p>	
(23, 5)	<p><u>Item:</u> Staff  <u>Mechanisms:</u>  <u>Factors:</u>  <u>Representations:</u> Functions as the primary coordinating staff officer responsible for:</p> <p>1) Developing policies, plans, and programs for transportation functions, including transport requirements, movement control, highway regulation (including traffic circulation, routing, and scheduling), and terminal transfer operations.</p> <p>2) The transportation officer may be assigned as a special staff officer (in divisions), or as an assistant to the ACoFS, G4, for transportation (in corps). Planning and supervising at division include more day-to-day direction of transport service operations, including:</p> <p>(a) Making plans and providing recommendations on requirements, availability, and employment of transportation.</p> <p>(b) Supervising transportation aspects of training.</p> <p>(c) Exercising staff supervision over transportation matters and advising the commander and staff on all matters about transportation.</p>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	(d) Establishing plans, technical training, and technical control of operations of support command units providing transportation support including supervision of the movement control center (MCC).	
(23, 6)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> <ul style="list-style-type: none"> <li>1) Technical control of operations of support command units providing transportation support including supervision of the movement control center (MCC).</li> <li>2) Supervising the OPSEC of transportation service activities.</li> </ul>	
(23, 9)	<u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The transportation officer supports allocation of resources as follows: <ul style="list-style-type: none"> <li>1) Planning, in coordination with the Air Force and the Navy, for use of these Services' transportation for Army movements and for use of Army transportation for their movements.</li> <li>2) Planning, in coordination with the ACoS, GS, and host or allied nations for use of their transportation for U.S. forces and for their support by Army transportation. This includes support of CMO and use of allocated national and local commercial transportation capabilities and facilities. Coordinating the command's transportation plans with higher, lower, and adjacent headquarters, as required.</li> </ul>	
(23, 11)	<u>Item:</u> Staff <u>Mechanisms:</u> <u>Factors:</u> <u>Representations:</u> The transportation officer informs the staff as follows: <ul style="list-style-type: none"> <li>1) Developing policies, plans, and programs for transportation functions, including transport requirements,</li> </ul>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 3
	<p>movement control, highway regulation (including traffic circulation, routing, and scheduling), and terminal transfer operations.</p> <p>2) Preparing the transportation portion of the command's plans and orders, base development plans, RAP plans, and troop basis for future operations.</p> <p>3) Planning, in coordination with the Air Force and the Navy, for use of these Services' transportation for Army movements and for use of Army transportation for their movements.</p> <p>4) Planning, in coordination with the ACofS, G5, and host or allied nations for use of their transportation for U.S. forces and for their support by Army transportation. This includes support of CMO and use of allocated national and local commercial transportation capabilities and facilities. Coordinating the command's transportation plans with higher, lower, and adjacent headquarters, as required.</p> <p>5) Making plans and recommendations, in coordination with the command's aviation officer, for employment of Army air transport capability in combat support and combat service support operations, to include use of airspace and air traffic control procedures.</p> <p>6) Providing advice to the support command commander and staff and assistance to subordinate unit commanders on transportation matters.</p> <p>7) Recommending training, allocations, and priorities for support command personnel and units engaged in transportation functions.</p> <p>8) Developing and recommending the troop basis and The Army Authorizations Document System (TAADS) changes pertaining to transportation functions.</p> <p>9) Making plans and providing recommendations on requirements, availability, and employment of transportation.</p>	

Directory 2.2.5 C<sup>2</sup> Special Staff (Continued)

<u>(ITEM, INTERACTION)</u>	<u>DESCRIPTION</u>	LEVEL 3
(23, 12)	<p><u>Item:</u> Forces <u>Mechanisms:</u> <u>Factors:</u> <b>Representations:</b> Providing advice to the support command commander and staff and assistance to subordinate unit commanders on transportation matters.</p>	

TABLE 2.3 COMMAND AND CONTROL FORCES

ITEM	INTERACTION					LEVEL 2									
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>WEAPONS</b>															
1 MANEUVER										*			*		
2 AVIATION				*						*			*		
3 AIR CAVALRY										*			*		
4 AIR DEFENSE										*			*		
5 ARTILLERY										*			*		
6 CLOSE AIR SUPPORT										*			*		
7 ELECTRONIC WARFARE										*	*		*		
<b>SUPPORT</b>															
8 ENGINEER										*			*		
9 COMBAT SERVICE SUPPORT										*			*		
10 NUCLEAR/BIOLOGICAL/ CHEMICAL										*			*		
11 AVIATION SUPPORT										*			*		
<b>SENSOR</b>															
12 INTELLIGENCE				*						*	*		*		
13 TARGET ACQUISITION SIGNAL										*			*	*	
14 BRIGADE		*									*				
15 BATTALION	*										*			*	
	STAFF	FORCES													
	COMMANDERS														

Directory 2.3 C<sup>2</sup> Forces

<u>(ITEM, INTERACTION)</u>	<u>LEVEL 2</u>
<u>DESCRIPTION</u>	
(1, 10)	<u>Item:</u> Commander <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Command information: mission, location, activity, strength, status, and enemy are reported according to SOP.
(1, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Operational, technical, and intelligence data and information: location, activity, status, strength, and enemy are reported according to SOP.
(1, 12)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Command, operational, technical, and intelligence data and information are exchanged among forces (including support and sensor) according to SOP. Examples include fire support targeting, supply locations, and status.
(1, 13)	<u>Item:</u> Commander <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Requests for additional fire support mission changes and service support are submitted through command channels.
(1, 14)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Force elements/units request additional service support.
(1, 15)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Force elements/units request additional service support and fire support from force units which are in direct support.
(2, -)	See (1, -) above.
(3, -)	See (1, -) above.
(4, -)	See (1, -) above.

Directory 2.3 C<sup>2</sup> Forces (Continued)

<u>(ITEM, (INTERACTION)</u>	<u>LEVEL 2</u>
<u>DESCRIPTION</u>	
(5, -)	See (1, -) above.
(6, -)	See (1, -) above.
(7, -)	See (1, -) above.
(8, 10)	<u>Item:</u> Commander <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Command information: mission status, location, activity, unit status, strength, and enemy are reported according to SOP. Reports are routed to both maneuver and functional area commands, as required.
(8, 11)	<u>Item:</u> <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Operational and technical data and information: location, mission status, activity, unit status, and unit strength are reported according to SOP. Reports are routed to both maneuvers and functional area commands, as required.
(8, 12)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Command, operational, intelligence, and technical information and data are exchanged among forces (including weapons and sensors) according to SOP. Examples include intelligence gained during mission execution, location, and status.
(8, 13)	<u>Item:</u> Commander <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Requests for additional fire support, mission changes, and additional service support are submitted through command channels.
(8, 14)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Force elements/units request additional service support through normal staff technical channels.

Directory 2.3 C<sup>2</sup> Forces (Continued)

(ITEM, INTERACTION)	DESCRIPTION	LEVEL 2
(8, 15)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Force elements/units request additional service support and fire support from force elements which are in direct support.	
(9, -)	See (8, -) above.	
(10,-)	See (8, -) above.	
(11,-)	See (8, -) above.	
(12, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Intelligence data and unit operational information shall be reported from sensors and/or ground stations according to SOP.	
(12, 12)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Targeting data shall be reported to appropriate forces through direct links.	
(12, 14)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Sensors shall request combat and combat service support from superior command staff elements according to SOP.	
(12, 15)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Sensors shall request combat and combat service support from direct support forces according to SOP.	
(13, -)	See (12, -) above.	
(14, 3)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Signal elements will organize available communications to the forces as structured.	

Directory 2.3 C<sup>2</sup> Forces (Continued)

LEVEL 2

<u>(ITEM, INTERACTION)</u>	<u>DESCRIPTION</u>
(14, 11)	<u>Item:</u> Staff <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Signal elements will inform the staff concerning the status of communications assets.
(15, 3)	See (14, 3) above.
(15, 11)	See (14, 11) above.
(15, 15)	<u>Item:</u> Forces <u>Mechanism:</u> <u>Factors:</u> <u>Representations:</u> Lower echelon signal elements will request additional equipment and support from forces as required.

TABLE 2.3.1 C2 WEAPONS FORCES

ITEM	INTERACTION					LEVEL 3
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST	
	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	
<b>MANEUVER</b>						
1 MANEUVER BN (CO)				*	*	
2 ARMORED CAV SQDN (CORPS)				*	*	
3 ARMORED CAV SQDN (DIV)				*	*	
<b>AVIATION</b>						
4 AVN BN (CORPS)		*		*	*	
<b>AIR CAVALRY</b>						
5 AIR CAV TP (CORPS)				*	*	
<b>AIR DEFENSE ARTILLERY</b>						
6 CORPS GS HIMAD BTRY				*	*	
7 CORPS SHORAD BTRY				*	*	
8 DIV GSR HIMAD BTRY				*	*	
9 DIV SHORAD BTRY				*	*	
10 SHORAD PLT				*	*	
11 SHORAD SQD				*	*	
12 STINGER TEAM				*	*	
13 BDE DIVAD/STINGER BTRY				*	*	
<b>ARTILLERY</b>						
14 CORPS GS BTRY				*	*	
15 DIV FA BN (GS)				*	*	
16 DIV RETAINED GS BTRY				*	*	
17 BDE DS BTRY/FIST				*	*	
18 NAVAL SPR				*	*	
<b>CLOSE AIR SUPPORT</b>						
19 ATTACK HEL BN (CORPS)				*		
20 CB (AA) (DIV)				*		
21 AIR FORCE SORTIES				*		
<b>ELECTRONIC WARFARE</b>						
22 CORPS LEVEL JAMMERS				*	*	
23 DIV LEVEL JAMMERS (C&J PLT)				*	*	

STAFF  
COMMANDERS  
FORCES

Directory 2.3.1 C2 Weapon Forces

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(1, 11)	82, 84	<u>Item:</u> Bde Main <u>Representations:</u> Unit status, combat information (enemy status, NBC conditions, POWs captured), coordination of routes and checkpoints new location, time of arrival, unit status upon arrival.	
(1, 14)	82, 143	<u>Item:</u> Bde FSE Staff, including Navy and AF Personnel <u>Representations:</u> Fire support	
	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Periodic POL, ammunition authorization	
	82	<u>Item:</u> Bde Main <u>Representations:</u> Support	
	82	<u>Item:</u> Bde <u>Representations:</u> CAS (immediate)	
	101	<u>Item:</u> Bde Main CP Avn Sec Staff <u>Representations:</u> Aviation support (immediate)	
	101	<u>Item:</u> Bde Main CP Engr Sec Staff <u>Representations:</u> Engineer support (immediate)	
	123	<u>Item:</u> Bde S2 Staff <u>Representations:</u> Intelligence requests	
(2, 11)	189	<u>Item:</u> Corps Movement Ctrl Ctr Staff <u>Representations:</u> Status reports	
	75	<u>Item:</u> Armd Cav Regt <u>Representations:</u> Mission status, enemy units, unit status, NBC and obstacle reports, POWs	
	75	<u>Item:</u> Armored Cav Regt Main CP <u>Representations:</u> Status reports (critical), SITREPS	
(2, 14)	75	<u>Item:</u> Armd Cav Regt <u>Representations:</u> Requests for support	
	98	<u>Item:</u> Div Main CP Avn Sec Staff <u>Representations:</u> Requests for aviation support	
	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff, Div Matl Mgmt Ctr Staff <u>Representations:</u> POL requests and ammunition authorization	

Directory 2.3.1 C<sup>2</sup> Weapon Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(3, 11)	81	<u>Item:</u> Div TAC CP, Cav Bde (Air Attack) CB(AA) <u>Representations:</u> Mission status, enemy status, unit status, NBC conditions and obstacles, weather, terrain, POWs	
	81	<u>Item:</u> Cav Bde (Air Attack) CB(AA) <u>Representations:</u> Administration/log reports	
	78	<u>Item:</u> Div Main <u>Representations:</u> Oplan coordination	
(3, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> Periodic POL requests, ammunition authorization	
	78	<u>Item:</u> Div TAC CP <u>Representations:</u> Immediate support	
(4, 5)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Personnel transport	
(4, 11)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Unit status reports	
(4, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL requests, ammunition authorization	
(5, 11)	76	<u>Item:</u> Armd Cav Regt <u>Representations:</u> Mission status, enemy status/activity, NBC and obstacle reports.	
	189	<u>Item:</u> Corps Movement Ctrl Ctr Staff <u>Representations:</u> Status reports	
(5, 14)	75	<u>Item:</u> Armd Cav Regt <u>Representations:</u> Support requests	
	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL requests, ammunition authorization	
(6, 11)	166	<u>Item:</u> GS HIMAD Bn Ops Ctr (BOC) Staff <u>Representations:</u> Unit status, air battle results	
	166	<u>Item:</u> Division Commander <u>Representations:</u> Advising on air defense priorities	
(6, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	

Directory 2.3.1 C<sup>2</sup> Weapon Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(7, 11)	168	<u>Item:</u> SHORAD Bn TOC Staff (Corps) <u>Representations:</u> Unit status, mission status upon completion	
(7, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(8, 11)	171	<u>Item:</u> GSR HIMAD BOC Staff <u>Representations:</u> Unit location, unit and equipment status, mission results and progress of air battle	
(8, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(9, 11)	172	<u>Item:</u> SHORAD Bn TOC Staff (Div) <u>Representations:</u> Unit status and location	
(9, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(10, 11)	170	<u>Item:</u> Corps SHORAD Btry, SHORAD Bn TOC Staff (Div) <u>Representations:</u> Equipment status	
	82	<u>Item:</u> Bde Main <u>Representations:</u> Location reports	
(10, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff, Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(11, 11)	170	<u>Item:</u> Corps SHORAD Btry <u>Representations:</u> Targets engaged, sightings without engagement	
	82	<u>Item:</u> Bde Main <u>Representations:</u> Location reports	
(11, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff, Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(12, 11)	170	<u>Item:</u> Corps SHORAD Btry <u>Representations:</u> Targets engaged, sightings without engagement	
	170	<u>Item:</u> Div SHORAD Btry <u>Representations:</u> Unit status, engagements, sightings	
	82	<u>Item:</u> Bde Main <u>Representations:</u> Location reports	

Directory 2.3.1 C<sup>2</sup> Weapon Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(12, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff, Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(13, 11)	170	<u>Item:</u> SHORAD Bn TOC Staff (Div) <u>Representations:</u> Unit status reports	
	82	<u>Item:</u> Bde Main <u>Representations:</u> Location reports	
(13, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(14, 11)	136	<u>Item:</u> FA Bde HQs <u>Representations:</u> Availability of nuclear/chemical weapons	
(14, 14)	189, 195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL requests, ammunition authorization	
(15, 11)	136	<u>Item:</u> Div Artillery TOC Staff <u>Representations:</u> Availability of nuclear/chemical weapons	
(15, 14)	189, 195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(16, 11)	137	<u>Item:</u> Div FSE Staff, Bde FSE Staff, including Navy and AF Personnel <u>Representations:</u> Availability of nuclear/chemical weapons	
	137	<u>Item:</u> Div Artillery TOC Staff <u>Representations:</u> Unit status, mission fired/completed, ammunition expended, combat effectiveness, damage assessment, change in status, ready to fire	
(16, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(17, 11)	143	<u>Item:</u> Bde FSE Staff, including Navy and AF Personnel <u>Representations:</u> Availability of nuclear/chemical weapons, unit status, SITREPS, missions fired/completed, ammunition expended, combat effectiveness	
(17, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, ammunition authorization	
(18, 11)	153	<u>Item:</u> Div FSE Staff, Bde FSE Staff, including Navy and AF Personnel <u>Representations:</u> Mission completion	

Directory 2.3.1 C<sup>2</sup> Weapon Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(19, 11)	76, 77	<u>Item:</u> Avn Bde <u>Representations:</u> Checkpoint and route coordination, new location, unit status, enemy situation, NBC and obstacles	
	189	<u>Item:</u> Corps Movement Ctrl Ctr Staff <u>Representations:</u> Status reports	
(19, 14)	189, 195	<u>Item:</u> Corps Matl Mgmt Ctr Staff, Div Matl Mgmt Ctr Staff <u>Representations:</u> POL requests, ammunition authorization	
	72	<u>Item:</u> Corps Main <u>Representations:</u> Support requests	
(20, 11)	76	<u>Item:</u> Avn Bde <u>Representations:</u> Checkpoint and route coordination, new location, unit status upon arrival, enemy information, NBC and obstacle reports	
	79	<u>Item:</u> Div Main <u>Representations:</u> Oplan coordination, combat reports	
(20, 14)	189, 195	<u>Item:</u> Corps Matl Mgmt Ctr Staff, Div Matl Mgmt Ctr Staff <u>Representations:</u> Periodic POL requirement, ammunition authorization	
(21, 11)	149, 153	<u>Item:</u> Div FSE Staff <u>Representations:</u> Bde Fse Staff, including Navy and AF Personnel Mission completion, damage assessment	
(22, 11)	113	<u>Item:</u> Corps Fusion Ctr Staff (A&P) <u>Representations:</u> Sensor reports, combat intelligence, status	
	139, 114	<u>Item:</u> Corps FA Section <u>Representations:</u> Target intelligence (QUICKFIRE)	
(22, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(23, 11)	116, 119	<u>Item:</u> Div Mission Mgmt Element, Div Fusion Ctr Staff (A&P), Div Fusion Center <u>Representations:</u> Combat intelligence, unit status, sensor reports.	
(23, 12)	139, 119	<u>Item:</u> Div FSE Staff <u>Representations:</u> Target intelligence (QUICKFIRE)	

Directory 2.3.1 C<sup>2</sup> Weapon Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	<u>DESCRIPTIONS (See Note at end of directory.)</u>	LEVEL 3 (FAROs)
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(23, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
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NOTE: The command and control functions for Force Items are limited to reporting and requesting; therefore, only the subject item and the information reported or requested to or from that item are shown in the directory. No mechanisms were identified.

NOTE:

These Level 3 items from the FARO Assessment for Automated CORDIVEM Requirements, JPL D-1192 have been included to illustrate the types of items which might be considered. Additional interactions have been noted on higher level tables.

TABLE 2.3.2 C2 SUPPORT FORCES

ITEM	INTERACTION					LEVEL 3									
	ORGANIZE			DIRECT		ALLOCATE			INFORM			REQUEST			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>ENGINEER</b>										*			*		
1 CORPS ENGR CBT BN (HVY)										*			*		
2 CORPS NON-TAC BDG CO										*			*		
3 CORPS ADM CO										*			*		
4 CORPS ENGR WATER SUP CO										*			*		
5 DIV ENGR CO										*			*		
6 DIV TAC BDG CO										*			*		
<b>COMBAT SERVICE SUPPORT</b>										*			*		
7 CORPS POL SPL BN										*			*		
8 CORPS AMMUN BN										*			*		
9 CORPS MOT TRANS BN										*			*		
10 CORPS MAN BN, DS										*			*		
11 CORPS MAN BN, GS										*			*		
12 CORPS TAM BN										*			*		
13 CORPS MISSL SPR BN										*			*		
14 CORPS AMBUL CO										*			*		
15 CORPS HOSP'S										*			*		
16 CORPS SPL & SER BN										*			*		
17 DIV SPL & SER CO										*			*		
18 DIV MOT TRANS CO										*			*		
19 DIV LT MAN CO										*			*		
20 DIV HVY MAN CO										*			*		
21 DIV MISSL MAN CO										*			*		
22 DIV TAM BN										*			*		
23 DIV MED SPR CO										*			*		
24 BDE ATP (PERSONNEL)										*			*		
25 FWD DET S&T BN										*			*		
26 FWD CO MAN BN										*			*		
27 FWD SPR MED CO										*			*		
<b>NUCLEAR/BIOLOGICAL/ CHEMICAL</b>										*			*		
28 CORPS NBC DEF CO										*			*		
<b>AVIATION SUPPORT</b>										*			*		
29 CORPS ASSAULT HEL BN										*			*		
30 CORPS ASSAULT SPR HEL CO										*			*		
31 DIV CSAC										*			*		

STAFF  
FORCES  
COMMANDERS

Directory 2.3.2 C2 Support Forces

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(1, 11)	92, 189	<u>Item:</u> Corps Main CP Engr Sec Staff <u>Representations:</u> Unit status	
	94	<u>Item:</u> Div CP Engr Sec Staff <u>Representations:</u> Mission status, unit status, information gathered during mission	
(1, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(2, 11)	97	<u>Item:</u> Corps Main CP Engr Sec Staff <u>Representations:</u> Unit status	
	97	<u>Item:</u> Div CP Engr Sec Staff <u>Representations:</u> Mission status, unit status, information from mission	
(2, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(3, 11)	95	<u>Item:</u> Corps Main CP Engr Sec Staff <u>Representations:</u> Mission status (and nuclear fire confirmation), unit status reports (including munition status), information gathered during mission (NBC reports on contaminated areas)	
(3, 14)	189, 195	<u>Item:</u> Corps Matl Mgmt Ctr Staff, Div Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(4, 11)	96	<u>Item:</u> Corps Main CP Engr Sec Staff <u>Representations:</u> Unit status, NBC reports, location of water supply points, volume of water available.	
(4, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(5, 11)	101	<u>Item:</u> Div CP Engr Sec Staff <u>Representations:</u> Mission status, unit status, information gained during mission	
(5, 14)	101	<u>Item:</u> Div CP Engr Sec Staff <u>Representations:</u> Support requests	
(6, 11)	100	<u>Item:</u> Div CP Engr Sec Staff <u>Representations:</u> Mission status, unit status, information gained during mission.	

Directory 2.3.2 C<sup>2</sup> Support Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FARCs)
(6, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL	
	100	<u>Item:</u> Div CP Engr Sec Staff <u>Representations:</u> Support requests	
(7, 11)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL requirements forecast, unit status	
(7, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL requests	
(8, 11)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Unit status	
(8, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(9, 11)	189	<u>Item:</u> Corps Composite Group/Bde HQ, Corps Matl Mgmt Ctr Staff <u>Representations:</u> Unit status	
(9, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(10, 11)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Status reports	
	192	<u>Item:</u> ADPC <u>Representations:</u> Status reports on maintenance and materiel and on unit status	
	93	<u>Item:</u> Corps Main CP Avn Sec Staff <u>Representations:</u> Route and checkpoint coordination, mission status, unit status, combat information gathered during mission.	
(10, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> PCL	
(11, 11)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Status reports	
(11, 11)	192	<u>Item:</u> ADPC <u>Representations:</u> Status reports on maintenance and materiel and on unit status	

Directory 2.3.2 C2 Support Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(11, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(12, 11)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Status reports	
(12, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Coordinate AVIM Co support, POL	
(13, 11)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Status reports	
(13, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Coordinate maintenance and supply management, POL	
(14, 11)	193	<u>Item:</u> Corps Medical Group HQ Staff <u>Representations:</u> Task status at end of mission, unit status report	
(14, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(15, 11)	194	<u>Item:</u> Corps Medical Group HQ Staff <u>Representations:</u> Operational status reports	
(15, 14)	194	<u>Item:</u> Corps Medical Group HQ Staff <u>Representations:</u> Evacuation support	
(16, 11)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Maintenance and materiel status	
(16, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(17, 11)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL status reports, unit status	
(17, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(18, 11)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> Periodic status reports	
(19, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL	

Directory 2.3.2 C<sup>2</sup> Support Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(19, 11)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> Periodic status reports	
(19, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> Missile maintenance support, POL	
(22, 11)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> Status reports	
(22, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> Backup aviation maintenance, POL	
(23, 11)	198	<u>Item:</u> Div Medical Bn HQ Staff <u>Representations:</u> Unit status	
(23, 14)	198	<u>Item:</u> Div Medical Bn HQ Staff <u>Representations:</u> Requests for evacuation	
(24, 11)	193	<u>Item:</u> Corps Ambulance Cos <u>Representations:</u> Status information	
(25, 11)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL, Status reports, unit status	
(25, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL requests	
(26, 11)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> Periodic status reports	
(26, 14)	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> Missile maintenance support, POL	
(27, 11)	199	<u>Item:</u> Div Medical Bn HQ Staff <u>Representations:</u> Unit status reports	
(27, 14)	199	<u>Item:</u> Div Medical Bn HQ Staff <u>Representations:</u> Evacuation support	
(28, 11)	95	<u>Item:</u> Corps Main CP Engr Sec Staff <u>Representations:</u> Bounds of area of contamination, unit status, NBC reports	
(28, 14)		<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	

Directory 2.3.2 C<sup>2</sup> Support Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(29, 11)	93	<u>Item:</u> Corps Main CP Avn Sec Staff <u>Representations:</u> Route and checkpoint coordination, mission status, unit status, combat information gathered during mission	
(29, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> Periodic POL requests, ammunition authorization	
(30, 11)		<u>Item:</u> Corps Movement Ctrl Ctr Staff <u>Representations:</u> Unit status.	
(30, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(31, 11)	93	<u>Item:</u> Div Main CP Avn Sec Staff <u>Representations:</u> Route and checkpoint coordination reports, mission status, unit status, and combat information from operations in forward area	
(31, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
<p>NOTE: The command and control functions for Force Items are limited to reporting and requesting; therefore, only the subject item and the information reported or requested to or from that item are shown in the directory. No mechanisms were identified.</p> <p>NOTE:</p> <p>These Level 3 items from the FARO Assessment for Automated CORDIVEM Requirements, JPL D-1192 have been included to illustrate the types of items which might be considered. Additional interactions have been noted on higher level tables.</p>			

TABLE 2.3.3 C2 SENSOR FORCES

ITEM	INTERACTION						LEVEL 3								
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>INTELLIGENCE</b>															
1 CORPS LRRP'S										*			*		
2 CORPS SIGINT SENSORS										*			*		
3 CORPS R/S SENSORS										*			*		
4 DIV SIGINT SENSORS										*	*		*		
5 DIV R/S SENSORS										*			*		
6 DIV REM TEAMS										*			*		
7 DIV LRRP'S										*			*		
8 GS RADAR CO						*									
<b>TARGET ACQUISITION</b>															
9 DIV TAB										*			*	*	*
10 SHORAD FAAR PLT										*			*		

TABLE 2.3.4 SIGNAL FORCES

ITEM	INTERACTION						LEVEL 3								
	ORGANIZE	DIRECT	ALLOCATE	INFORM	REQUEST										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>BRIGADE</b>															
		*								*					
<b>BATTALION</b>															
		*									*			*	

Directory 2.3.3 C<sup>2</sup> Sensor Forces

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(1, 11)	114	<u>Item:</u> Corps Fusion Ctr Staff (A&P) <u>Representations:</u> Sensor reports, SITREPS, unit status, coordination	
	114	<u>Item:</u> Corps FA Section <u>Representations:</u> Target intelligence	
(1, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(2, 11)	114	<u>Item:</u> Corps Fusion Ctr Staff (A&P) <u>Representations:</u> Sensor reports	
	115	<u>Item:</u> Corps FA Section <u>Representations:</u> Target intelligence (QUICKFIRE)	
(2, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(3, 11)	115	<u>Item:</u> Corps Fusion Ctr Staff (A&P) <u>Representations:</u> Sensor reports	
	115	<u>Item:</u> Corps FA Section <u>Representations:</u> Target intelligence (QUICKFIRE)	
(3, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(4, 11)	119	<u>Item:</u> Div Mission Mgmt Element, Div Level Jammers <u>Representations:</u> Sensor reports	
	119	<u>Item:</u> Div FSE Staff <u>Representations:</u> Target intelligence (QUICKFIRE)	
(4, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(5, 11)	120	<u>Item:</u> Corps Fusion Ctr Staff (A&P) <u>Representations:</u> Sensor reports	
	119	<u>Item:</u> Div FSE Staff <u>Representations:</u> Target intelligence (QUICKFIRE)	
(5, 14)	121	<u>Item:</u> Div FSE Staff <u>Representations:</u> Coordinate sensor emplacement	

Directory 2.3.3 C<sup>2</sup> Sensor Forces (Continued)

(ITEM, INTERACTION)	FARO RG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
	121	<u>Item:</u> Div G3 <u>Representations:</u> Coordinate sensor recovery (helos)	
	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(6, 11)	120	<u>Item:</u> Div Fusion Ctr Staff (A&P) <u>Representations:</u> Sensor reports	
	119	<u>Item:</u> Div FSE Staff <u>Representations:</u> Target intelligence (QUICKFIRE)	
(6, 14)	121	<u>Item:</u> Div FSE Staff <u>Representations:</u> Coordinate sensor placement	
	120, 123	<u>Item:</u> Div G3 <u>Representations:</u> Coordinate sensor recovery	
	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(7, 11)	122	<u>Item:</u> Div Fusion Ctr Staff (A&P) <u>Representations:</u> Sensor reports	
(7, 14)	189	<u>Item:</u> Corps Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(8, 6)	121	<u>Item:</u> REMs <u>Representations:</u> REM locations	
(9, 11)	140	<u>Item:</u> Div Artillery TOC Staff <u>Representations:</u> Unit status, SITREPS, mission completion, enemy location, activity, other enemy information	
(9, 14)	141	<u>Item:</u> Corps Level Jammers <u>Representations:</u> Immediate fire mission requests	
	195	<u>Item:</u> Div Matl Mgmt Ctr Staff <u>Representations:</u> POL	
(10, 11)	170	<u>Item:</u> Corps SHORAD Btry, SHORAD Bn TOC Staff (Div) <u>Representations:</u> Equipment status	
	82	<u>Item:</u> Bde Main <u>Representations:</u> Location reports	

Directory 2.3.3 C<sup>2</sup> Sensor Forces (Continued)

(ITEM, INTERACTION)	FARO PG #s	DESCRIPTIONS (See Note at end of directory.)	LEVEL 3 (FAROs)
(10, 14)	189, 195	<u>Item:</u> Corps Matl Mgmt Ctr Staff, Div Matl Mgmt Ctr Staff <u>Representations:</u> POL	

NOTE: The command and control functions for Force Items are limited to reporting and requesting; therefore, only the subject item and the information reported or requested to or from that item are shown in the directory. No mechanisms were identified.

NOTE:

These Level 3 items from the FARO Assessment for Automated CORDIVEM Requirements, JPL D-1192 have been included to illustrate the types of items which might be considered. Additional interactions have been noted on higher level tables.

Directory 2.3.4 C<sup>2</sup> Signal Forces

FARO PG #s	DESCRIPTIONS	LEVEL 3 (FAROs)
9	<p>** Emplacement times, down times, repair times, etc., for signal facilities can be obtained from signal-oriented simulations and depicted in a corps/division model as changes in the status of combat control unit communication assets."</p> <p>Based on this assumption, no characteristics of signal facilities were discussed in the FAROs; however, major communication centers were noted as providing communications.</p>	

NOTE:

These Level 3 items from the FARO Assessment for Automated CORDIVEM Requirements, JPL D-1192 have been included to illustrate the types of items which might be considered. Additional interactions have been noted on higher level tables.

## SECTION 4

### FUNCTIONAL REQUIREMENTS

This section describes the software functions and subfunctions which are required for the Automated CORDIVEM Simulation Environment. The identified simulation environment will assist the analyst and modeler in designing, developing, and applying the several model versions and data inputs that are required to support specific studies using the Automated CORDIVEM. The functional requirements for the specified simulation environment shall be used as the controlling structure in the design of the Automated CORDIVEM Simulation Environment hardware and software systems. The basis for the broad set of functional requirements presented in this section is developed from the combination of the identified User Requirements and the Combat System Requirements. Particular combat system characteristics and the user requirements associated with studies concerning them will determine specific versions of the Automated CORDIVEM. In this context, the Functional Requirements provide an organization of processes and a guide which shall be used to ensure that the Automated CORDIVEM provides a balanced combat simulation with appropriate detail for each study. It is anticipated that these Functional Requirements will be refined and updated during an iterative process of designing the actual computer code for the simulation environment.

Figure 4-1a is a schematic representation of the functional hierarchy of the total simulation environment. Functions in the hierarchy shall represent simulation functions and will not necessarily correspond to specific, identifiable combat items or elements. The hierarchy of functions shall be developed for each specific application to include a statement of the input to the function, the process accomplished by the function using the input, and the output from the function as a result of the processing. The input and output description shall contain increasing levels of detail in the successive levels of the functional description. The level of detail shall be consistent with the increasing level of detail in the hierarchy.

## FUNCTIONAL HIERARCHY

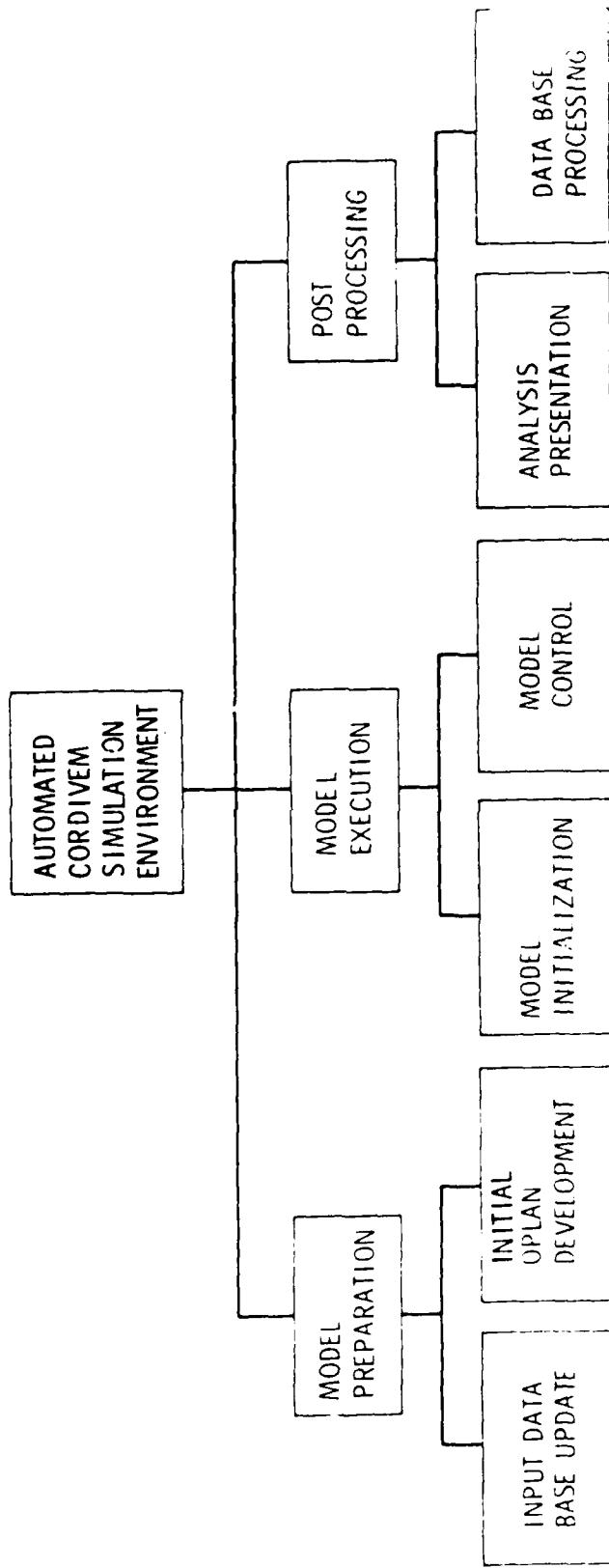


Figure 4-1a

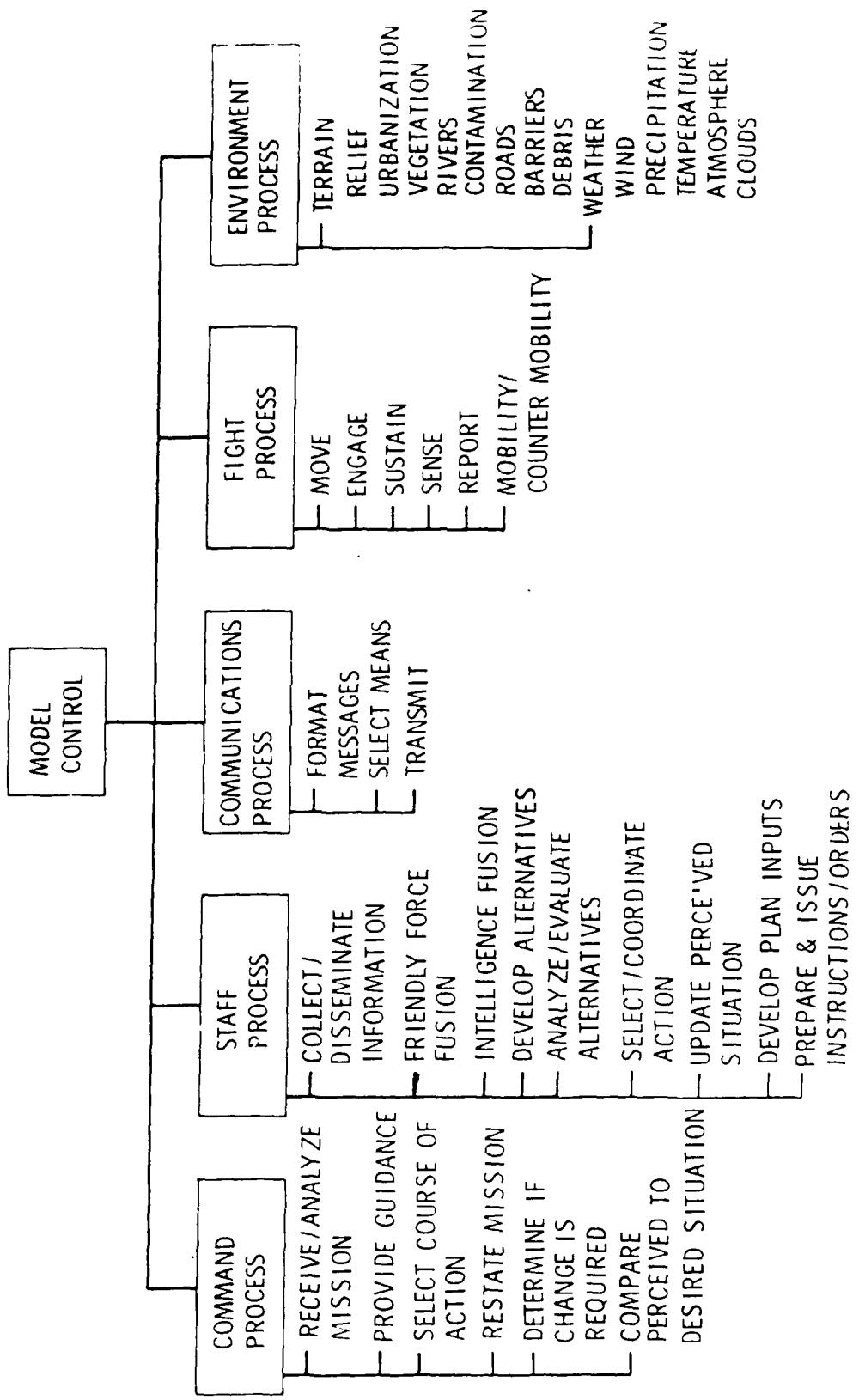
The Model Control function (Figure 4-1b) contains the model subfunctions which provide the dynamic computer simulation of force-on-force combat: Command Process, Command Support Process, Communications Process, Fight Process, and Environment Process. A key aspect of the Model Control subfunctions for the corps and division level is the tactical command and control planning. Dynamic tactical planning with respect to the initial input OPLANS is central to both the Command Support Process and the Command Process. These processes in turn directly control the several combat elements represented in the Communications and Fight processes.

The Model Preparation function contains the subfunctions of Input Data Base Update and Initial Operations Plan Development. The Input Data Base Update subfunctions (Figure 4-1c) shall be developed to maximize the use of automated data processing and to interface with the hierarchy of models and/or the Army Model Improvement Program Data Base. The input data base will be used by the Initial OPLAN Development subfunctions in developing the initial operations plans for Red and Blue forces. The command and control planning process is reflected in both the Model Preparation and Model Execution functions. The planning process for Red and Blue is essentially the same; data representing differences in organization, doctrine, and tactics particularizes the results of the process.

The Post Processing function (Figure 4-1a) contains the Analysis Presentation and Data Base Processing subfunctions. These subfunctions address both analysis and presentation of individual simulation runs as well as comparison of multiple simulation runs. Further, it provides for historical analysis of previous study items and AMIP model hierarchy comparisons.

The following paragraphs address functional requirements for the several Automated CORDIVEM Simulation Environment functions and subfunctions.

## FUNCTIONAL HIERARCHY ( CONTINUED )



## FUNCTIONAL HIERARCHY ( CONTINUED )

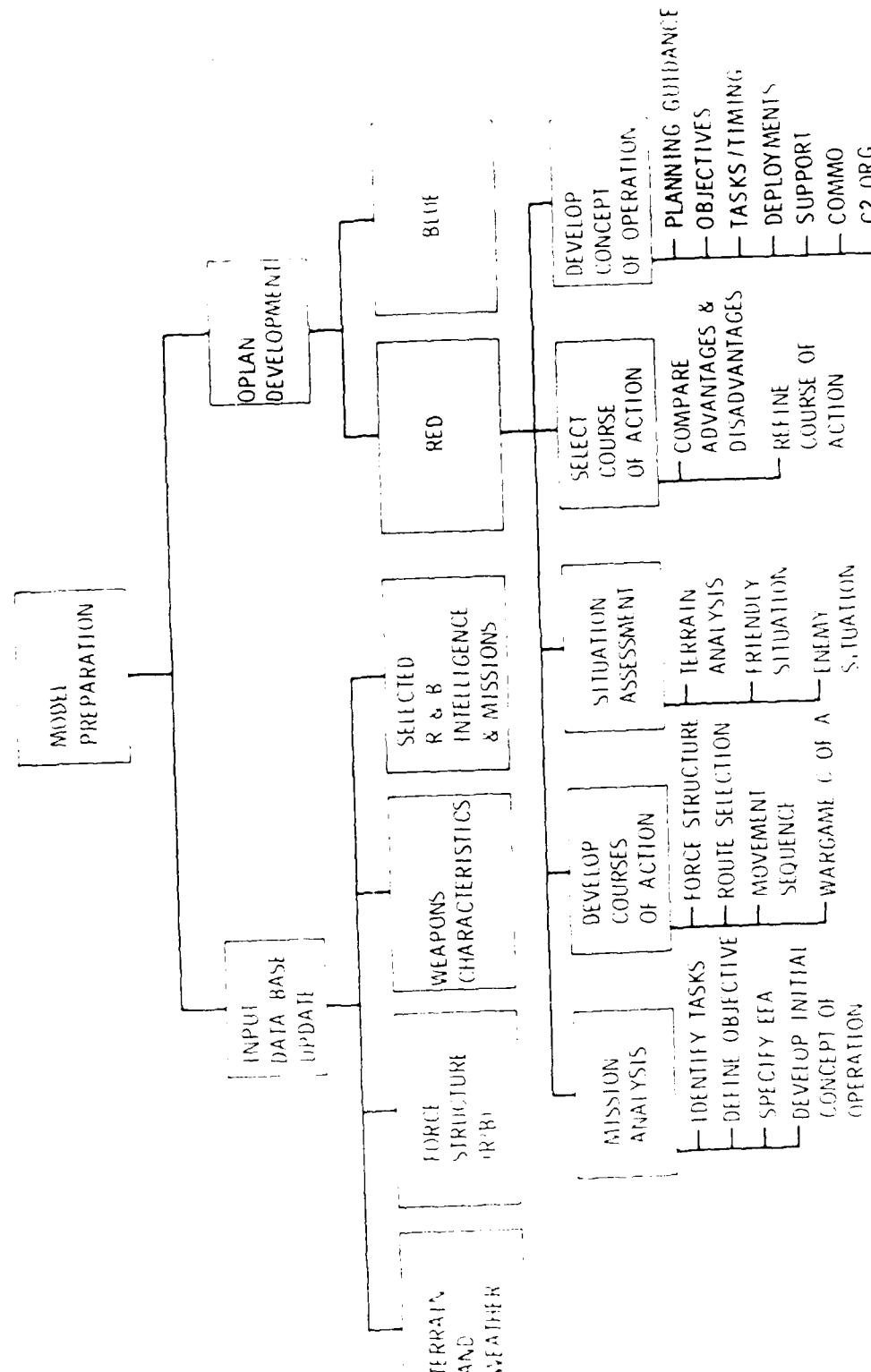


Figure 4-1c

## 4.1

## MODEL EXECUTION

This subfunction encompasses all those processes directly associated with the representation and assessment of force-on-force combat. The structure of the model shall be designed to accommodate and where possible, parallel the identified simulation problem. The following paragraphs discuss significant functional considerations.

The procedure given in Section 3, Combat System Requirements, for describing the Army corps/division system to be simulated made a distinction and recognized a need for separating command and control related functions from battle functions. Further, a review of the command and control related functions showed that there was a distinct difference between command functions and staff functions. Likewise, within command and control, the unique nature of communications (while being inexorably linked with C<sup>2</sup>) separates it from C<sup>2</sup> functions related to commander and staff processes. However, for the major groupings noted, there is a definite similarity from echelon to echelon within the functions performed by commanders and their staffs and communications. The level of resolution and the scope of considerations changes for each echelon but the fundamental processes are very closely related.

Conversely, with the exception of terrain related items, battle engagement functions do not contain elements which suggest separation based on item characteristics. Within the battle functions, significant similarities exist among the several items as they relate to the mechanisms associated with battle interactions. A primary example of one such common feature is movement on the battlefield (or above it); all items of the corps and division are mobile. Hence, a common model function which handles all movement is desirable in terms of efficiency and simplicity. A review of the other battle mechanisms provides insights into potential common model functions. Ensuring that the model functional design parallels the naturally occurring structure provides two significant benefits: first, the model is readily explainable to persons unfamiliar with the model details, and second,

the subprocesses in the model will provide results which are more directly comparable with measurable events in the physical world. In this sense, the execution of the model provides the dynamic linkage and chain effects among the battle mechanisms which only describe individual or single item-on-item interactions.

The specific design of the computer code used to implement the Automated CORDIVEM shall be developed with two major considerations: first, the code must execute in the allotted time; and second, it must support the analysis process. The first consideration suggests that some form of parallel processing may be desirable and perhaps even necessary. The second consideration suggests that significant computational and storage resources will be required to provide traceability through the simulation processes. In either case, a clear, reversible transformation from the functional requirements to the code design shall be developed.

#### 4.1.1            Model Option Selection

As an analysis tool, the Automated CORDIVEM will undergo changes to input data, changes to model function performance data, and changes or additions to model functions. Efficient processes which require a minimum of detailed computer program knowledge shall be developed to support model option selection and initialization. The primary considerations in specifying this function are the user requirements for study execution and model set-up. This model function serves to supplement and augment the support software associated with model preparation which will be discussed later.

##### 4.1.1.1        Model Update

This subfunction shall assist in incorporating code changes and determining areas of the model which are impacted by the changes. It shall be executed off-line prior to model execution.

#### 4.1.1.2

#### Model Data Preparation

This subfunction shall provide assistance in constructing linkage tables and pointers from basic input data. It shall be executed off-line prior to model execution. It shall accommodate minor changes to performance parameters which do not require code modification.

#### 4.1.1.3

#### Model Data Input

This subfunction shall interface with manual and automated input procedures and means associated with Model Preparation. It shall control output options which shall include as a minimum the following items:

- a) Simulation time interval, or simulation interrupt events; for example, 72 hours of simulated battle or loss/gain of key objectives, loss of key assets, failure of planning function at selected echelon.
- b) Snapshot interval for battlefield summary; maximum rate, one per 30 minutes.
- c) Battlefield summary items; for example, unit locations (maps), attrition figures, unit status, command decisions (with time), perceived situation, unit activity, plan status (selected units).
- d) Optional files to maintain; for example, killer-victim matrix, engagement histories (selected unit), unit organizational histories, plan updates (selected elements).

#### 4.1.2

#### Command and Control Processes

Analysis using a corps/division level model necessarily involves extensive consideration of command and control which is the essence of the corps and division echelons' function. Accurate treatment of the command and control functions as they relate to force-on-force combat is therefore essential. The "Functional Analysis of Command and Control", CAORA/TR-21/83 identified the seventeen processes associated with command and control shown in Figure 4-2. These seventeen processes are expanded further in this document in order to identify specific subprocesses and to associate them with functional requirements for the model. These seventeen processes contain both command and staff functions. Further, they represent a general logic flow and process organization. For purposes of developing and presenting the model requirements, these seventeen processes and their subprocesses will not necessarily be treated in the numbered order shown in Figure 4-2. They will be addressed with the particular command and staff function in question. In particular, each process of the C<sup>2</sup> Process Flow contains some aspect of planning.

Planning is central to the C<sup>2</sup> process. It provides for and is an integral part of the decision-making process. The commander is responsible for the final decision and provides guidance to the staff in order to direct their development of information and alternative courses of action during the planning process. In turn, the development of the information by the staff identifies specific decision elements and conditions which will require potential command action. In this sense, tactical decision-making is a form of problem analysis in which the decision(s) evolve through an iterative process involving both the commander and staff. In those cases where action must take place without a full planning sequence, the decision associated with the action still directly relates to the unit's stated mission, identified objectives, and basic concept of operation as initially or previously planned.

# COMMAND AND CONTROL PROCESS FLOW MANEUVER CONTROL

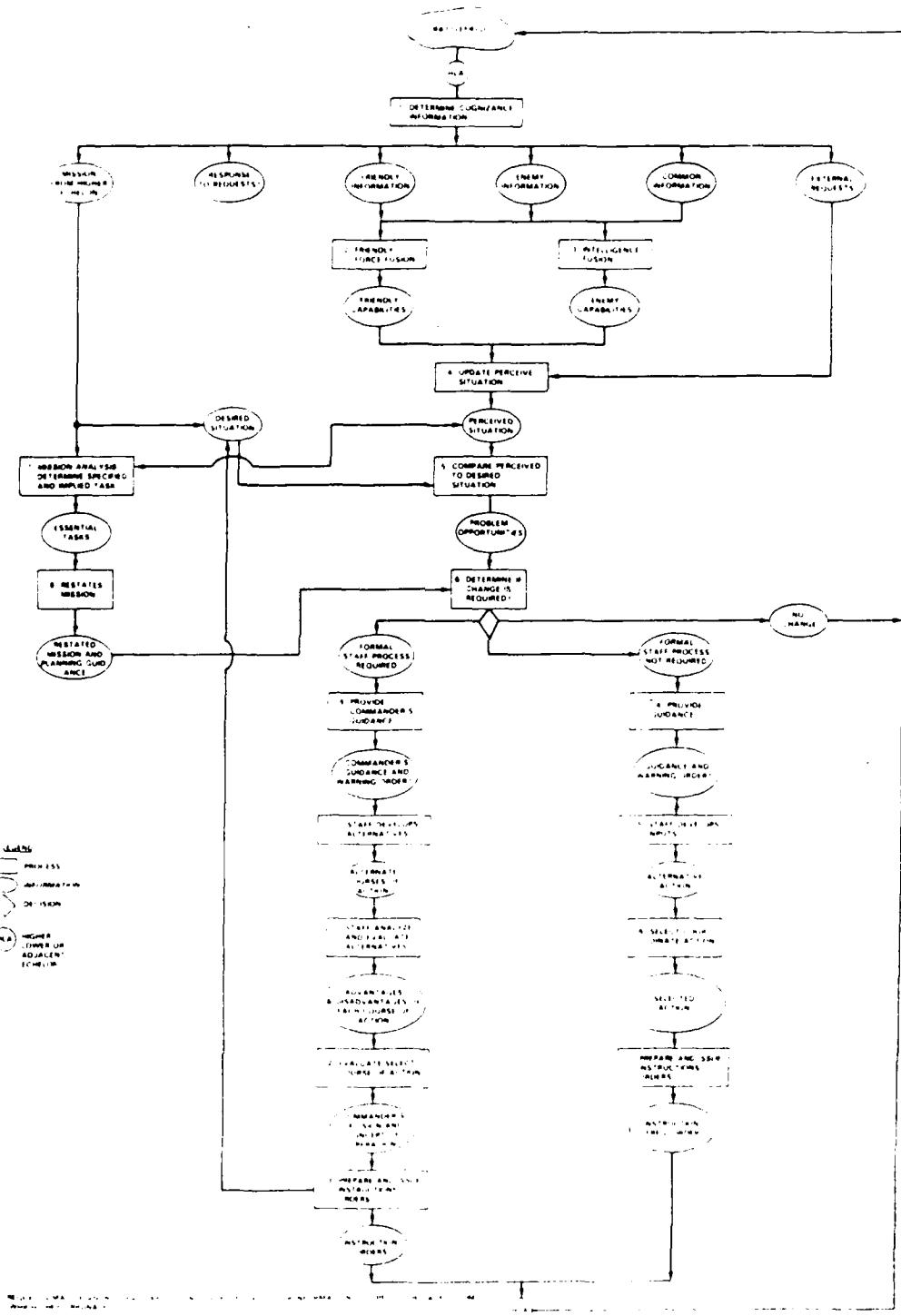


Figure 4-2

The planning process for a corps/division level model with company level resolution involves several plans at each echelon from corps to brigade which are combined into a single plan for each unit of each echelon. These unit plans are developed within the constraints and requirements of the superior echelon plan. Representation of the coordination, development, and updating of these multiple plans is essential for an accurate representation of command and control processes. The following paragraphs discuss both specific and general functional requirements for representing the command and control process.

At all echelons for the Blue and Red forces, decisions are made concerning mission, maneuver, fire support, service support, etc. The decisions shall be directly related to the input Red and Blue OPLANS. The input OPLANS shall identify the major objectives and constraints on the forces. Dynamic staff planning and replanning in the model shall be accomplished in order to achieve the initial input objectives within the identified constraints. The command and staff functions of planning, contingency planning, adjusting resources, etc. shall be exercised to the maximum extent within the bounds of the initial plan and constraints. This function shall utilize the operations plan development process identified in CAORA Technical Report TR-21/83, "Functional Analysis of Command and Control". In that report, planning is divided into seventeen processes which represent the command and staff activities necessary to identify and pursue a course of action within a combat environment. The processes and their interrelationships are discussed in detail in subsequent paragraphs of this section. However, before initiating this discussion it should be indicated that the initial OPLAN and SOP for the units will reflect the input organizational and operational implementation, e.g., communication nets, command posts, staff responsibilities, command authority, etc. of the user. Within limits and constraints established by the user, these relationships shall be treated dynamically to accommodate force reorganization and mission changes that are developed as simulation proceeds. User requirements that drive the detailed and comprehensive representation of command processes for this function shall be balanced against the technical feasibility of

developing artificial intelligence processes during the System Design phase. Final specification of subprocesses for this function will be determined following identification of related C<sup>2</sup> factors, planning requirements and technical capability. When defined, the model shall provide for the following planning and command functions. Table 4-1 provides a summary of the functions and identified software functional requirements.

4.1.2.1        Determine Cognizance/Information Distribution (Process 1)

Information generated both externally and internally to the model will be routed through Determine Cognizance/Information Distribution. This process serves to organize the data and restrict or encourage access by designated staff elements at each echelon as appropriate to the simulation of events.

4.1.2.1.1      Collect and Process Friendly Data

Data collected for friendly force activities will be processed to determine which data bases (staff elements, sections, etc.) will receive the information.

4.1.2.1.1.1     Echelons

Data bases shall be organized by echelon (for each unit) except for common data (such as terrain or weather). Echelons to be represented are corps, division, brigade, and battalion. Company or lower echelons shall be represented only for specialized units or assets.

For each echelon, information shall be retained on operations, personnel, weapons system, equipment, intelligence, and logistics assets. The data shall be organized around the development of staff products, e.g., messages, reports, estimates, plans, etc., and the flow of those products. The staff performance shall reflect the standard operating procedures determined for the organization and shall reflect the associated

characteristics of support equipment (such as automation aids) and human factors. This ensures that each level in the planning process will deal with the level of detail necessary for its function. Further data may be suppressed or enhanced dependent upon simulation requirements. The following data categories shall be considered:

a) Operations

- Mission
- Force Posture/Disposition
- Firepower
- Action
  - Size
  - Intensity
- Location of Unit
- Speed
- Direction of Travel
- Adjacent Unit Information

b) Personnel

- Casualty/Effectiveness Ratio
- Attachments
- Detachments

c) Weapon System Equipment

- Artillery Assets
- Armor Assets
- Air Assets
- Air Defense Assets
- Communication Assets

c) Intelligence

- EW Assets
- Observation Assets
  - Artillery Observers
  - Sensors
  - Location of Assets
- Intelligence Reports
  - Sightings
    - Unit Strength
    - Kind
    - Unit Number
    - Direction of Travel
    - Posture
    - Speed
    - Combat Strength

e) Logistics

- Current Supplies
  - Ammunition
  - POL
  - Spare Parts
- Expenditure Rate
- Resupply Points and Times
- Transportation Assets
  - Air
  - Land

f) Operations Plans

- Situation
- Mission
- Execution
- Service Support
- Command and Signal

4.1.2.1.2      Collect and Process Enemy Data

The enemy data collected and its structure shall mirror the data maintained for the friendly force. However, enemy data shall reflect the command structure and data flow characteristics of the enemy force rather than friendly.

4.1.2.1.2.1      Echelon

The following data categories shall be considered:

a)      Operations

    Mission

    Force Posture/Disposition

    Firepower

    Action

        Size

        Intensity

    Location of Unit

    Speed

    Direction of Travel

    Adjacent Unit Information

b)      Personnel

    Casualty/Effectiveness Ratio

    Attachments

    Detachments

c)      Weapon System Equipment

    Artillery Assets

    Armor Assets

    Air Assets

    Air Defense Assets

    Communication Assets

d) Intelligence  
    EW Assets  
    Observation Assets  
        Artillery Observers  
        Sensors  
        Location of Assets  
    Intelligence Reports  
        Sightings  
            Unit Strength  
            Kind  
            Unit Number  
            Direction of Travel  
            Posture  
            Speed  
            Combat Strength

e) Logistics  
    Current Supplies  
        Ammunition  
        POL  
        Spare Parts  
    Expenditure Rate  
    Resupply Points and Times  
    Transportation Assets  
        Air  
        Land

#### 4.1.2.1.3     Collect and Process Common Information

The following data categories shall be considered:

- a) Terrain
- b) Weather

4.1.2.1.4        Receive External Requests

External requests for data and information are received for specific instances of all the above data categories.

4.1.2.2        Receive and Analyze Mission (Process 7)

The receive and analyze mission process is the initial process for developing operations orders or mission changes which are received from a higher echelon or deduced from operations information. The process examines the orders and converts them into specific tasks necessary for planning for mission accomplishment. These tasks serve as input data to the staff planning processes and serve to assist in developing alternative courses of action. Five subtasks are performed in receive mission. They are receive mission, define objectives, define tasks, and develop commander's estimate.

4.1.2.2.1        Receive Plan

Accepts the operations plan from higher echelon and subdivides it into relevant elements: situation, mission, execution, service support, command and signal.

4.1.2.2.2        Objectives Development

The development of objectives submodule examines the mission statement and accompanying information and identifies specific stated or implied objectives. Objectives relate to the following: terrain, time, and forces. Types of missions related to these objectives include such items as the following: reinforce, attack, withdraw, hold, delay, deceive.

4.1.2.2.3        Define Tasks

The define tasks submodule identifies the specific tasks which must be performed to obtain the objectives. The lower the echelon, the more specific the tasks (to support more direct objectives). Tasks which would be identified include such items as follows: move, maneuver, fortify, mine, support, supply, communicate, observe.

4.1.2.2.4        Commander's Estimate

The commander's estimate is based on personal knowledge of the situation and on staff estimates. It results in a decision on how to accomplish the given mission.

4.1.2.3        Restate Mission (Process 8)

In support of planning, the commander refines specific elements of the OPLAN into Mission/Tasks appropriate for receiving staff elements.

4.1.2.4        Provide Commander's Guidance (Process 9)

The commander's guidance process requires macro level modeling of the complete planning activity. There are three subprocesses associated with the modeling: outline the desired situation, specify special conditions, and identify subordinate affected.

4.1.2.4.1        Outline Desired Situation

This subprocess uses quantification of choice factors coupled to the perceived situation, military doctrine, and projected enemy intentions to outline the desired situation upon completion of the unit's mission. It would include the following: commander's estimate, doctrine, project enemy intentions.

4.1.2.4.2        Specify Conditions Requiring Special Attention  
of Subordinates

The specify conditions submodule identifies areas of concern for examination during choices of action development. Specifically, these areas represent the identification of conditions where uncertainty is high. These areas would include: resources, vulnerabilities, opportunities, key terrain, coordination with adjacent echelon/services. Planning time constraints are identified for each staff element and subordinate echelon.

4.1.2.4.3        Subordinates Affected

The subordinates affected submodule identifies the staff or support functions which are affected by the mission in order to provide specific guidance to alternative development within each specialty area. The staff areas of concern are personnel, intelligence, operations, logistics, communications.

4.1.2.5        Friendly Force Fusion (Process 2)

The friendly force fusion process uses the data base information to derive an image of the current state of the friendly force at each echelon.

4.1.2.5.1        Echelon

4.1.2.5.1.1        Derive Estimate of Friendly Resources

At each echelon the model must quantify the resources available to the echelon for executing its mission. These resources take the form of personnel, weapon system, equipment, intelligence, and logistics assets. They include the following:

- a) Personnel
  - Attachments
  - Detachments
  - Unit Numbers
  - Casualties/Morale Factor
  - Fire Power
- b) Weapon System Equipment
  - Artillery Support Assets
  - Armor Assets
  - Air Assets
  - Air Defense Assets
  - Communication Assets
- c) Intelligence
  - EW Assets
  - Observation Assets
    - Observers
    - Sensors
- d) Logistics
  - Current Supplies
  - Ammunition
  - POL
  - Spare Parts
  - Resupply Points/Times
  - Transportation Assets
    - Air
    - Land

#### 4.1.2.5.1.2 Friendly Limitations

Friendly resources will be analyzed to define (quantify) the limitations of each echelon and unit. The limitations will consist of

restrictions on supply, firepower, and maneuver. The limitation will be used to determine the operations options of the friendly force during the planning process. Items such as the following are considered:

- a) Mobility (from transport/logistics)
- b) Firepower (from logistics/fire support)
- c) Maneuver (from above and terrain)

Key Terrain for:

- Defense
- Ambush
- Fortification
- Offense
- Communications

Terrain analysis will be scaled to the level of detail necessary to support each echelon modeled.

#### 4.1.2.5.1.3 Friendly Capabilities

The capabilities of each echelon of the friendly force will be quantified for the features important to planning its engagements, including:

- Speed
- Maneuver
- Combat Power
- Concealment
- Supply
- Support
- Air
- Artillery
- Engineering

Location  
Direction of Travel  
Disposition

4.1.2.5.1.4      Friendly Vulnerabilities

Friendly vulnerabilities will be identified and quantified. For purposes of planning, vulnerabilities will identify risks to the friendly force mission objectives which might be capitalized upon by the enemy. Areas of concern include the following: resource limitations, flank/rear exposure, air cover, artillery support, communications links, counter EW capability, supply links, fire power, terrain.

4.1.2.5.1.5      Friendly Mission Status

Friendly mission status will be determined at each echelon. This status report will be used to identify situations which are not occurring as projected during the planning process. Each echelon will report its mission/task and progress.

4.1.2.5.1.6      Contact with Enemy

The contact with enemy subprocess identifies the nature and intensity of conflict with enemy units. This is used to determine whether adjustments in a unit's status, resources, or capabilities has occurred or should occur. It considers the following: engaged, maneuvering, disengaging, not in contact, in proximity, force ratios.

4.1.2.6      Intelligence Fusion (Process 3)

Intelligence fusion is performed to quantify the enemy force information. The results of this evaluation provide the inputs to situation assessment. The major difference between friendly fusion and intelligence fusion is the degree of uncertainty about the data used to derive estimates of

enemy activity. This uncertainty factor will create differences in implementation of enemy fusion processes over friendly fusion.

4.1.2.6.1            Echelonment

Estimates of enemy force status will be derived by each echelon. The situation will be derived using estimates of enemy resources, enemy limitations, terrain analysis, weather analysis, enemy capabilities, enemy vulnerabilities, and enemy intentions.

4.1.2.6.1.1        Derive Estimate of Enemy Resources

Estimates of enemy resources will include the size, type status, and location of personnel, equipment, intelligence, logistics. The estimates will be accumulated from sensor reports and other intelligence obtained from higher and lower echelons. Uncertainty will be determined from the source, quality, and age of the information.

a)        Personnel

Attachments

Detachments

Unit Numbers

Fire Power

b)        Weapon System Equipment

Artillery Support Assets

Armor Assets

Air Assets

Air Defense Assets

Communication Assets

c) Intelligence  
    EW Assets  
    Observation (Collection) Assets  
        Human Observers  
        Sensors

d) Logistics  
    Current Supplies  
    Ammunition  
    POL  
    Spare Parts  
    Resupply Points/Times  
    Transportation Assets  
        Air  
        Land

4.1.1.6.2     Enemy Limitations

Enemy limitations will be determined from the characteristics the enemy force described under resources. Limitations are derived for three factors: mobility (from transport/logistics), firepower (from logistics/fire support), maneuver (from above and terrain).

4.1.1.6.2.1     Limitations of Terrain

Terrain information will be analyzed with respect to the following features: relief, urbanization, rivers, contamination, debris, roads, trafficability, mines, railroads, forestations, airports, bridges, and pipelines. Characteristics of terrain will be used to identify factors affecting the threat:

a) Mobility Factors

- Avenues of Approach
- Concealment
- Trafficability
- River Crossings
- Roads
- Railroads
- Airports
- Pipelines

b) Counter-Mobility Factors

- Forestation
- Minefields
- Debris
- Contamination
- Rivers
- Urbanization
- Passability
- Relief

c) Key Terrain for:

- Defense
- Ambush
- Fortification
- Offense
- Communications

Terrain information shall be scaled to the level of detail necessary to support each echelon modeled.

4.1.1.6.2.2 Weather Analysis

Weather information shall be analyzed with respect to the following features: visibility, temperature, wind, and precipitation. These

factors will be used so that the following conditions can be determined with respect to their impact on the threat:

- a) Visibility
  - Impact on Air Operations
  - Impact on Ground Operations
  - Impact on Communications
- b) Temperature
  - Impact on Ground Operations
  - Impact on Communications
- c) Wind
  - Impact on Air Operations
  - Dispersion of smoke contaminants
  - Impact on Communications
- d) Precipitation
  - Impact on Ground Operations
  - Trafficability of Terrain
  - Value of River Crossings
  - Visibility
  - Mobility
  - Communications

#### 4.1.2.6.2.3      Enemy Capabilities

Enemy capabilities shall be used to identify the activity and the range of operations open to each echelon of the enemy. This information will be used at a later point to project probable enemy behavior. The items to be considered in assessing enemy capabilities are the following:

- Speed
- Maneuver
- Combat Power
- Concealment
- Supply
- Support
  - Air
  - Artillery
  - Engineering
- Location
- Direction of Travel
- Disposition

#### 4.1.2.6.2.4      Enemy Vulnerabilities

Enemy vulnerabilities shall be quantified concurrently with enemy capabilities. The vulnerabilities will represent opportunities for friendly force planning to exploit in order to achieve mission objectives. They will be used to assess risk to success of friendly proposed courses of action to achieve mission objectives. Vulnerabilities include the following: general limitations, flank/rear exposure, air cover, artillery cover, communications links, counter EW capability, supply links, fire power, terrain.

#### 4.1.2.6.2.5      Enemy Intentions

Critical to the planning process is the derivation of enemy intentions. Enemy intentions shall be derived using enemy force capability, disposition, proximity, posture, maneuver limitations, resources, terrain weather, and doctrine. This information will be synthesized to project the mission of the enemy force at each echelon. It includes consideration of the following:

- a) Current situation and activity (maneuver, disposition, capability, proximity, posture, limitations, doctrine, terrain, resource, weather).
- b) Projected mission (attack, delay, engage/disengage, deceive, hold/block, reinforce, supply, support).

#### 4.1.2.6.2.6      Enemy Force Situation

By accumulating the information on enemy intentions, vulnerability, limitations, resources, and progress, current situation of enemy force can be determined. This cumulative score will be used in situation assessment to evaluate the situation at each echelon: intentions, vulnerability, limitations, resources, progress, projected reactions.

#### 4.1.2.7      Update Perceived Situation (Process 4)

The update of the perceived situation is crucial to the planning process and general supervision of operations. All plans, adjustments to plans, and courses of action which are developed will use the perceived situation as the base line for projecting their success, problems, risk, or impact on future events. Further, the perceived situation will be used to validate or invalidate plans or actions currently in effect. The perceived situation update is accomplished by two subprocesses, Integrate Fusion Products and Project Situation.

##### 4.1.2.7.1      Integrate Fusion Products

The integration of fusion products provides a synopsis of battlefield conditions. By quantifying friendly force situation, enemy force situation, terrain and weather, and adjusting unit positions (based on time since estimates received) a snapshot of the battle can be created at each

echelon. It will include, as a minimum, the following: friendly force situation, enemy force situation, terrain, weather, time since estimates received.

4.1.2.7.2        Project Situation

The snapshot of battlefield conditions is updated to project future conditions based on an established timeline using friendly and enemy movement, weather, and terrain. This provides the projected posture of the troops at the timeline. It is this projection which provides the perceived situation: enemy movement/status, friendly movement/status, weather changes, project future timeline, area of operations/posture.

4.1.2.8        Compare Perceived/Desired Situation (Process 5)

Concurrent with each adjustment of the operations plan, the simulation shall generate a series of timelines and associated decision parameters. The timelines and parameters represent a desired situation which will be used to evaluate the progress of friendly forces. This process of evaluation will be performed by comparing the desired situation with the perceived situation in terms of the identified parameters. The comparison will be performed using combinations of the following subprocesses.

4.1.2.8.1        Compare Perceived/Desired Unit Positions

Thresholds will be used to monitor progress. The thresholds will be evaluated based on the priority of sub-unit mission accomplishment to the overall objective.

4.1.2.8.2        Compare Perceived/Desired Combat/Force Ratios

Compare the variance between perceived, relative combat power (fire power, posture, mission, terrain, support) for each unit and its

opposing force with the anticipated combat power. Determine whether difference is within expectations.

4.1.2.8.3        Compare Perceived/Desired Supply Situation

Perceived and desired supply situations are compared to determine whether supplies are within tolerable levels at each echelon to support missions. Priority of mission is used to determine overall effect of supply inadequacies.

4.1.2.8.4        Compare Perceived/Desired Support Situation

At each echelon perceived support for transportation, artillery, air defense, and air support are compared with desired support. Impact on mission is determined by evaluation of risk threshold.

4.1.2.8.5        Compare Perceived/Desired Communications

Variance between perceived communications situations and desired communications is determined using distance between links, breaks in the network, and quality (extent of jamming, traffic) of linkage. Threshold values are used to define priority links and qualitative variance.

4.1.2.8.6        Compare Perceived/Desired I/EW Situation

Extent of jamming of enemy communications is evaluated based on message traffic. Intelligence situation is evaluated based on perceived uncertainty of intelligence reports and I/EW asset location and condition. This is compared with the desired situation to determine impact of intelligence asset situation.

4.1.2.8.7      Compare Perceived/Anticipated Enemy Intentions

Enemy perceived intentions are compared to deduced intentions to detect significant variance between expected behavior and actual behavior.

4.1.2.8.8      Identify Difference Between Perceived/Desired Situation

The previously discussed variables are accumulated to identify the difference between the perceived and desired situation. The difference is compared to thresholds for the accumulated difference as well as individual factor differences which are identified as affecting high priority mission success.

4.1.2.8.9      Identify Problems

The difference between expectations and the perceived situation is used to specify specific problem areas affecting plan execution at each echelon. It is these "problems" which will be rectified during the replanning activity. Problems will be of the following types:

Friendly Vulnerabilities (See Friendly Fusion)

Units Failing Mission or At Risk

Support Inadequacies

Fire Support Priorities

Close Air Support

Air Defense

I/EW

Adjacent Units

Supply

Communication Inadequacies

Coordination Inadequacies

4.1.2.8.10

Identify Opportunities

Concurrent with the determination of problems will be the identification of opportunities which have arisen out of the changing combat situation. The opportunities will be of the following types:

Enemy Vulnerabilities (Perceived)  
Enemy Units at Risk  
Opportunity for Deception  
Discriminate Between Deep Battle/Close In Battle Opportunities

4.1.2.9

Determine If Change Required (Process 6)

The quantifications developed in the evaluation process are used by the determine if change required process to determine whether to enter into a replanning cycle or adjustment process.

4.1.2.9.1

Evaluate Problems/Opportunities

Problems and opportunities are evaluated to quantify risk and to quantify variance associated with each problem and opportunity. Quantification includes consideration of the following:

- a) Quantify Risk Problems (position relative to objective, support, communication, coordination, status of forces)
- b) Quantify Variance Problems (significance of difference between perceived/desired situation, significance of difference between perceived/desired enemy intentions)

- c) Quantify Risk Opportunities (contribution to mission accomplishment, priority of objective satisfied by opportunity, probability of achieving objective in perceived situation)
- d) Quantify Variance Opportunities (significance of difference between perceived and projected situation)

#### 4.1.2.9.2 Assessment

Once risk and variance have been determined they are compared against thresholds to identify whether change in the current plan is necessary or desirable.

#### 4.1.2.9.3 Determine Scope of Change Required

- a) Compare Degree of Variance, (priority of missions, degree of success/failure, echelons affected)
- b) Match to Thresholds
- c) Identify Echelon/Units Required to Initiate Change

#### 4.1.2.10 Staff Develops Alternatives (Process 10)

The staff develops alternatives process identifies the alternatives for accomplishing each task needed to successfully complete the mission. The staffs work independently to develop response to the current situation. Several alternative actions may be developed for a task. Consideration during the development of alternatives is given to the Perceived Situation, Commander's Guidance, Terrain Analysis, Mission Analysis, Friendly Doctrine, Projected Early Reactions.

4.1.2.10.1        Perceived Situation

Perceived situation shall contain the staff estimate of the situation which may be reformulated as required by the alternative development process.

4.1.2.10.2        Commander's Guidance

Commander's guidance provides commander's area of concern, intent, and restrictions. Among these would be allocation of time available for planning, need for coordination among staff elements, and commander's estimate of situation. The commander's guidance shall focus and control the staff planning.

4.1.2.10.3        Terrain Analysis

Terrain shall be analyzed for the following features: relief, urbanization, rivers, contamination, debris, roads, trafficability, mines, railroads, forestation, airports, bridges, and pipelines. Characteristics of terrain will be quantified to identify:

- a)        Mobility Factors
  - Avenues of Approach
  - Concealment
  - Trafficability
  - River Crossings
  - Roads
  - Railroads
  - Airports
  - Pipelines

b) Counter-Mobility Factors

- Forestation
- Minefields
- Debris
- Contamination
- Rivers
- Urbanization
- Passability
- Relief

4.1.2.10.4

Weather Analysis

Weather shall be analyzed for the following features: visibility, temperature, wind, and precipitation. These factors shall be quantified such that the following conditions can be determined:

a) Visibility

- Impact on Air Operations
- Impact on Ground Operations
- Impact on Communications

b) Temperature

- Impact on Ground Operations
- Impact on Communications

c) Wind

- Impact on Air Operations
- Dispersal of smoke, contaminants
- Impact on Communications

d) Precipitation

Impact on Ground Operations

Trafficability of Terrain

Value of River Crossings

Visibility

Mobility

Communications

4.1.2.10.5 Mission Analysis

Mission analysis shall be reviewed by each staff to determine whether additional sub-missions or tasks are implied by alternatives developed as well as coordination requirements.

4.1.2.10.6 Friendly Doctrine

The staff shall identify doctrine which supports alternative development by the staff.

4.1.2.10.7 Projected Enemy Reaction

Projected Enemy Reaction to alternatives shall be identified.

4.1.2.11 Staff Analyzes and Evaluates Alternatives (Process 11)

Each staff element separately evaluates each of the alternatives developed to accomplish the tasks identified for its areas of responsibility. Each alternative is compared with the perceived situation, friendly doctrine, mission analysis, terrain analysis, and projected enemy reaction to identify its advantages and disadvantages. Advantages and disadvantages may be tactical, logistical, or coordinative. The commander will collect each of the alternatives offered for each staff activity into a series of coherent courses of action. These will be wargamed to project the probability of success for each alternative. The probability of success will

be evaluated based on the assumptions used to wargame the course of action in order to derive the degree of uncertainty associated with each course of action.

4.1.2.12        Evaluate>Select Course of Action (Process 12)

The evaluate/select course of action module evaluates each course of action to determine the one which presents the best likelihood of success. The evaluation criteria for selecting a course of action will include courses of action possible, principles of war, doctrine, measures of effectiveness, measures of performance, the mission priority, and projected advantages/disadvantages. After an alternative is selected, the decision criteria for evaluating its success will be identified.

4.1.2.12.1      Compare Courses of Action

Prioritize Tasks by Necessity for Mission

4.1.2.12.2      Compare Advantages/Disadvantages

4.1.2.12.3      Prioritize Advantages/Disadvantages

4.1.2.12.4      Identify Assumptions

Enemy Intentions

Quality of Intelligence

4.1.2.12.5      Quantify Uncertainty for Each Course of Action

4.1.2.12.6      Define Decision Criteria

After an alternative has been selected the course of action is used to develop the decision criteria for evaluation of the echelons' progress toward mission accomplishment as the simulation unfolds. Associated with this process is the development of key indicators for any problem or opportunity identification when comparing perceived/desired situations.

4.1.2.12.7      Uncertainty Reduction

Key indicators are identified for problem identification in order to compare perceived/desired situation.

4.1.2.13      Prepare and Issue Instructions/Orders (Process 13)

Prepare and issue instructions process converts the OPLAN into specific instructions for each subordinate unit from which they may perform their planning functions. This conversion includes the development of specific guidance from higher echelon detailing constraints or execution requirements not specifically detailed in the plan for the receiving unit's mission.

4.1.2.13.1      Convert Course of Action into Concept of Operations

The convert course of action into concept of operations subprocess translates the selected course of action into specific mission statements for lower echelons in the form of an operations plan. The specific items of concern to the concept of operations are as follows:

4.1.2.13.1.1      Scheme of Maneuver

4.1.2.13.1.1.1      Execution

Direction of Attack  
Axes of Advance  
Coordination Points  
Phase Lines  
Objectives  
Fire Support Coordination  
Limits of Advance

4.1.2.13.1.1.2    Operations Items

- Boundaries
- Positions
- FEBA
- Routes
- Assembly Areas
- Command Posts
- Lines of Departure

4.1.2.13.1.1.3    Time of Execution/Conditions of Effect

4.1.2.13.1.1.4    Services Support

- Supply Routes
- Supply Points/Times
- Support Installations

4.1.2.13.1.1.5    Fire Support

- Priority of Fires
- Targeting Priority
- Preparation Fires
- I/EW Priorities
- Mines/Obstacles Fortification
- Preparation
- Air Defense Priority
- Close Air Support

4.1.2.13.1.1.6    Phases of Operation

- Timing of Tasks/Missions

4.1.2.13.1.1.7    Unit Tasks

Maneuver Units  
Reserves  
Fire Support Tasks

4.1.2.13.1.1.8    Command and Signal

CP Locations  
Alternate CPs  
Rule on Use of Equipment

4.1.2.14            Provide Guidance (Process 14)

The provide guidance module is the staff mechanism for fine tuning the operation plan during plan execution. It is the mechanism used to maintain the integrity of the plan under the constraints of actual operational conditions. This module performs the coordinating functions necessary to guide the individual staff elements in the development of fragmentary orders for lower echelons. These orders adjust individual unit behaviors in response to local combat situations which present problems or opportunities for mission accomplishment. It is limited to an adjustment role which reinforces the execution of the missions, tasks, and objectives within the unit's area of responsibility.

4.1.2.14.1          Outline Desired Situation

This subprocess uses quantification of choice factors coupled to the perceived situation, military doctrine and projected enemy intentions to outline the desired situation upon completion of the unit's mission and identify adjustment constraints.

4.1.2.14.2        Specify Conditions Requiring Special Attention  
of Subordinates

The specify conditions subprocess indicates areas of concern for examination during choices of action identification. Specifically, these areas represent the identification of conditions where uncertainty is high. These areas would include resources, vulnerabilities, opportunities, key terrain, coordination with adjacent echelons.

4.1.2.14.3        Subordinates Affected

The subordinates affected subprocess identifies the staff or support functions which are affected by the adjustment in order to provide specific guidance for alternative identification within the affected area. The staff areas of concern are personnel, intelligence, operations, logistics, communications.

4.1.2.15           Staff Develops Inputs (Process 15)

This process is a recombination of subprocesses from the Staff Develops Alternatives and Staff Analyzes and Evaluates Alternatives processes. The recombination is possible because the scope of the search for alternative courses of action has been narrowed by the specificity of the required operations plan adjustment. The information used to support the evaluation includes perceived situation, desired situation, enemy force status, friendly force status, friendly vulnerabilities, friendly opportunities, mission analyses, friendly doctrine, and projected enemy reactions.

4.1.2.15.1        Compare Proposed Course of Action/Projected

4.1.2.15.2        Identify Advantages/Disadvantages

4.1.2.15.3        Evaluate Courses of Action

- 4.1.2.15.3.1      Compare Courses of Action
- 4.1.2.15.3.2      Prioritize Advantages/Disadvantages
- 4.1.2.15.3.3      Identify Assumptions
- 4.1.2.15.3.4      Quantify Uncertainty for Each Course of Action
- 4.1.2.16            Select/Coordinate Action (Process 16)

The select/coordinate action process wargames the adjustment alternatives which have been evaluated. The module will select the alternative which provides the highest probability of success consistent with the mission of the unit. Factors which are used to determine the probability of success are mission analyses, situation assessment, the alternative courses of action possible, and the evaluation criteria (including principles of war, doctrine, measures of effectiveness, measures of performance), the mission priorities, and projected advantages/disadvantages of the course of action.

- 4.1.2.16.1      Modify Decision Criteria

After an alternative has been selected the course of action is used to develop the desired situation scenario for later evaluation of the echelon's progress toward mission accomplishment. Associated with this process is the development of key indicators for problem identification when comparing perceived/desired situations.

- 4.1.2.16.2      Uncertainty Reduction

Key indicators are identified for problem identification to compare perceived/desired situation.

4.1.2.17

Prepare and Issue Instructions/Orders (Process 17)

This process issues fragmentary orders to amend plans or missions. It is important to note that the information forwarded to a lower echelon could result in major planning efforts at that echelon due to mission modification.

4.1.2.18

Specific Planning Requirements

Each of the command and control processes which were described in the paragraphs above and the indicated flow of information in Figure 4-2 are part of, and together encompass all of the military planning process components. This section of the functional requirements develops a classification scheme which is used to (1) pinpoint what types of modeling considerations should be taken into account for the simulation of military planning, (2) determine exactly where in the planning scheme those considerations occur, and (3) illustrate the relationships or interactions among those considerations.

4.1.2.18.1

Description of Terms

The seventeen command and control processes of Figure 4-2 were decomposed into several subprocesses, each of which represents a specific command and control task to be done that helps to fulfill and clarify the main process of which it is a part. In order to more closely examine the meaning of these subprocesses (and to more fully understand the planning aspects of the processes of which they are a part), each subprocess will be categorized as being one or a combination of more than one of five different categories or facets which will be described later. Further, some subprocesses may need one of the various techniques associated with the broad field of Artificial Intelligence (A.I.) in order to properly simulate their activity. There are three A.I. techniques that appear useful at this point. Each subprocess will be associated with, at most, one of these techniques. The five categories or facets and the three types of A.I. to be addressed are discussed in the

following paragraphs. Following these descriptions, each subprocess developed for the processes of Figure 4-2 will be listed in tabular form along with the associated facets and techniques required.

4.1.2.18.1.1      Facets

a)      I. Information Flow

This facet refers to the collecting, processing, and distributing of information with respect to various echelons, command and staff levels. More exactly:

- (1) Collecting involves obtaining information from any unit, be it higher, adjacent, or subordinate (e.g., collect and process enemy data as indicated in subprocess 1.2 of Table 4-1,
- (2) Processing consists of the preparation, authentication, clarification, or drafting of information or an identification of information needs (e.g., specify conditions requiring special attention of subordinates, subprocess 9.2).
- (3) Distributing is concerned with the dispersal of operations and intelligence data, command/staff guidance, or orders/directives; what information is to be routed, where and for whom. It is mechanically implemented and should be considered as a standard operating procedure (as should collecting and processing). An example of a subprocess relating to this would be Issue Directives (numbered as subprocess 17.2 in Table 4-1).

Any subprocess complying with information requests from various sources is associated with this facet.

b) II. Projecting

Any subprocess associated with this facet should have implicit in its activity a need to identify with given probability the general outcome of a friendly action in terms of enemy reaction and resource capability. Subprocess 3.9, Project Enemy Reactions, serves as an example.

c) III. Deterministic Operations

This facet involves four subdivisions: estimating, prioritizing, updating, and comparing. Any subprocess which has any of these operations involved within its implementation (or any situation requiring straightforward modeling such as certain SOP operations) will be associated with this facet. The reason for grouping these categories together is that they are heavily dependent upon deterministic-type calculations or procedures. In some cases, a probabilistic type of analysis will be used in conjunction with deterministic calculations. It is tentative at this point which of these probabilistic analyses will be of a 'computationally' deterministic type as opposed to an A.I. type, the latter of which is involved with complicated information charts or production rules and 'inference engines' (control systems for production rules). This will be discussed more fully later.

- 1) **Estimating:** A subprocess which derives a perceived value of reality based upon comparison with standard templates. An example of this is Derive Estimate of Enemy Resources.
- 2) **Prioritizing:** Associates with each member of a list a certain priority value indicating the worth or likelihood of a member of the list with respect to a given situation. The subprocess Priority Advantages and Disadvantages has this as a facet.
- 3) **Updating:** Refers to renewing the perceived situation as in the subprocess Update Situation Perception.
- 4) **Comparing:** Implies that a comparison of a perceived and desired situation is evaluated using standards which are dependent upon the quantities compared or that a comparison of key elements of a plan is made. The subprocesses Compare Perceived/Desired Communications and Compare Courses of Action serve as examples of these.

d) IV. Algorithmic Methods

The subprocesses associated with this facet are highly characterized by algorithmic or semi-algorithmic methods which are involved in the logic and method of warfare strategy and tactics. Their motivation and implementation are at the heart of any planning type mechanism. The key difference between

this facet and deterministic operations is that the latter involves computation(s) or algorithm(s) based upon standard, mechanical procedures whose essential structuring or implementation are well known (other than information flow which was covered in Facet I) or very direct. Algorithmic methods involve a relatively complicated analysis whose procedural aspects and nature are not so well established or defined. Examples of subprocesses associated with this facet are Integrate Fusion Products and Identify Advantages/Disadvantages.

e) V. Command Involvement

This facet implies that guidance from the commander (at the same echelon) is being used to aid in the military planning process. Command involvement is specified as a facet because it provides a constraint to the planning process. The whole concept of the simulation of planning becomes feasible given (1) stated objectives of a mission, and (2) limitations on what should be done by the staff to comply with its echelon commander's guidance. As identified earlier, command guidance, together with the given mission objectives, provides a useful constraint to the planning process. With respect to the planning diagram of Figure 4-2, command guidance is used in processes 7, 8, 9, and 14. The nature of command guidance differs with respect to these subprocesses. For example, guidance provided within process 8 differs in content from that described in the whole of process 9. The following discusses the involvement of command guidance with the processes 7, 8, 9, and 14 in more detail.

Process 7

The higher echelon commander provides action and purpose together with his guidance for accomplishing the mission. The commander at the lower echelon uses this guidance and the stated mission to determine the current situation and make various projections.

Process 8

The commander provides his guidance in the form of (1) a restated mission, (2) work identification necessary to accomplish the mission, and (3) the objectives of a higher echelon commander.

Process 9

The commander identifies alternatives and restrictions with respect to the various tasks accomplished. He further identifies a set of alternative courses of action. This information is provided to the staff. Warning (orders) to subordinate commanders is provided when necessary.

Process 14

The function of the commander is the same as in Process 9 except that guidance may be provided at a more bounded level responding to small adjustments to the plan indicated by the process Determine if Change is Required.

It is required that in the planning mechanism, the initial command guidance (at the corps level) shall be provided by an outside source and subsequent command guidance at lower levels will be formulated automatically. This implementation will be facilitated by the constraint imposed by the input of the initial command guidance at corps level by the user including his statement of the mission and the enemy and friendly troop configurations, terrain, and time consideration.

The artificial intelligence classifications are as follows:

a) VI. Pattern Recognition

One of the goals of pattern recognition is to determine if certain relative positions (predescribed) exist among a given number of objects. The techniques for approaching this problem shall be useful in situations where a certain number and relative orientation of units are given and it is desired to deduce from this information whether or not this implies a certain battlefield situation. For example, if it were known that  $x$  units at location  $l_1$  and  $y$  units at location  $l_2$  implied  $z$  units at location  $l_3$ , then it would be desirable to have the machine be able to notice when  $x$  units are at  $l_1$  and  $y$  units are at  $l_2$ .

b) VII. Probabilistic Graph

These techniques shall be used to assess the likelihood or degree of certainty of various hypotheses using a relatively well-structured information graph. To achieve this goal, the nodes and arcs of the graph shall be ascribed various values relating to the theory of probability. Some nodes shall represent incoming data. Each node of this type will have a value associated with it whose magnitude depends upon the degree of reliability of

the data (assumptions) associated with the node. The values of these data nodes shall be the only variable associated with the graph.

c) VIII. Expert Systems

This branch of A.I. uses the mathematical ideas of VII together with a control procedure (or inference engine) and knowledge base consisting of production rules (if-then statements) obtained by frequent and numerous conversations with military experts to model the thinking process of those experts with respect to a particular problem. Various graphs are generated using the inference engine and production rules. These graphs are used to infer the likelihood of various hypotheses to model a weighing process essential to the construct of any decision-making device. The type of problem approached using this method is generally much more involved and less structured than those involved in VII. Also in VII, the general situation under study is structured by one or more fixed (in terms of structure) probability graphs. In expert systems, graphs of varying structure are generated using the inference engine. Their structure is dependent upon the hypothesis being tested. The formulation of commander's guidance shall be accomplished through expert system analysis. Based on the discussion in V, an expert system will then be of great help in focusing the staff planning activities.

The purpose of the following discussion is to clarify the nature and the difference between the two A.I. techniques: probabilistic graphs and expert systems. Expert systems will be discussed first.

In many expert systems, a fairly large number of production rules (on the order of hundreds) are used together with the inference engine to generate various probabilistic graphs. These graphs, together with some predeveloped mathematical technique, are used to formulate the likelihood of the truth of various hypotheses (each of which has one or more graphs 'grown' \* for it). An expert system is appropriate for a situation requiring the thinking, decision-making, or experience of a human expert. The situations modeled by expert systems tend to be complicated and involved.

Probabilistic graphs are useful in cases that are more tractable and handleable. Situations requiring this technique are well structured and can be represented by one (or a small number of) probabilistic graph(s). An example of this is when the likelihood of a fixed hypothesis is always needed to be determined at some point in the military planning process where, each time the likelihood of the hypothesis depends upon a different set of data and a different set of probabilities attached to the factors influencing the likelihood. In the probabilistic graph method, a graph representing the structure of the interrelation of all the facts, assumptions, and data used to derive the likelihood of the hypothesis is formed and incorporated into the program. Each time it is required to evaluate the likelihood of the hypothesis, the same graphical structure will be used to evaluate that likelihood. The only change is that different data and probabilities (due to the change of the environment being simulated) will be used (in conjunction with the fixed graphical structure).

\* This growth is directed and regulated by the inference engine.

Table 4-1. Planning Requirements Classification

PROCESSES AND SUBPROCESSES	FACTS	A.I.
1. DETERMINE COGNIZANCE/INFORMATION DISTRIBUTION		
1.1 Collect and Process Friendly Data	Information Flow	
1.2 Collect and Process Enemy Data	Information Flow	
1.3 Collect and Process Common Information	Information Flow	
1.4 Receive External Requests	Information Flow	
2. FRIENDLY FORCE FUSION		
2.1 Derive Estimate of Friendly Resources	Deterministic Operations	
2.2 Derive Friendly Limitations	Deterministic Operations	
2.3 Derive Friendly Capabilities	Deterministic Operations	
2.4 Derive Friendly Vulnerabilities	Deterministic Operations	
2.5 Determine Friendly Mission Status	Deterministic Operations	

Table 4-1. Planning Requirements Classification (Continued)

PROCESSES AND SUBPROCESSES	FACETS	A.I.
<b>3. INTELLIGENCE FUSION</b>		
3.1 Derive Estimate of Enemy Resources	Algorithmic Procedures	Probabilistic Graphs Pattern Recognition
3.2 Determine Enemy Limitations	Algorithmic Procedures	Probabilistic Graphs Pattern Recognition
3.3 Determine Terrain Limitations	Deterministic Operations	
3.4 Perform Weather Analysis	Deterministic Operations	
3.5 Determine Enemy Capabilities	Algorithmic Procedures	Probabilistic Graphs
3.6 Determine Enemy Vulnerabilities	Algorithmic Procedures	Probabilistic Graphs
3.7 Derive Enemy Intentions	Projecting Algorithmic Procedures	Probabilistic Graphs
3.8 Compile Enemy Force Situation	Deterministic Operations	
<b>4. UPDATE PERCEIVED SITUATION</b>		
4.1 Integrate Fusion Products	Algorithmic Procedures	
4.2 Project Situation	Projecting Algorithmic Procedures	Probabilistic Graphs

Table 4-1. Planning Requirements Classification (Continued)

PROCESSES AND SUBPROCESSES	FACETS	A.I.
<b>5. COMPARE PERCEIVED/DESIRED SITUATION</b>		
5.1 Compare Perceived/Desired Unit Positions	Deterministic Operations	
5.2 Compare Perceived/Desired Combat/Force Ratios	Deterministic Operations	
5.3 Compare Perceived/Desired Supply Situation	Deterministic Operations	
5.4 Compare Perceived/Desired Support Situation	Deterministic Operations	
5.5 Compare Perceived/Desired Communications	Deterministic Operations	
5.6 Compare Perceived/Desired I/EW Situation	Deterministic Operations	
5.7 Compare Perceived/Anticipated Enemy Intentions	Deterministic Operations	
5.8 Identify Difference Between Perceived/Desired Situation	Deterministic Operations	
5.9 Identify Problems	Deterministic Operations	
5.10 Identify Opportunities	Deterministic Operations	

Table 4-1. Planning Requirements Classification (Continued)

PROCESSES AND SUBPROCESSES	FACETS	A.I.
6. DETERMINE IF CHANGE IS REQUIRED		
6.1 Evaluate Problems/Opportunities	Algorithmic Procedures	Probabilistic Graphs
6.2 Assessment	Deterministic Operations	
6.3 Determine Scope of Change Required	Deterministic Operations	Probabilistic Graphs
7. RECEIVE AND ANALYZE MISSION		
7.1 Receive Plan	Information Flow Deterministic Operations	
7.2 Develop Objectives	Algorithmic Procedures Command Involvement	Expert Systems
7.3 Define Tasks	Algorithmic Procedures Command Involvement	Expert Systems
7.4 Develop Commander's Estimate	Algorithmic Procedures Projecting Command Involvement	Expert Systems
8. RESTATE MISSION		
8.1 Translate OPLAN Into Mission Tasks Appropriate for Echelon	Algorithmic Procedures	Expert System;

Table 4-1. Planning Requirements Classification (Continued)

PROCESSES AND SUBPROCESSES	FACETS	A.I.
<b>9. PROVIDE COMMANDER'S GUIDANCE</b>		
9.1 Outline Desired Situation	Projecting Algorithmic Procedures Command Involvement	Expert Systems
9.2 Specify Conditions Requiring Special Attention of Subordinates	Algorithmic Procedures Command Involvement	Expert Systems
9.3 Identify Subordinates Affected and Provide Specific Guidance	Algorithmic Procedures Command Involvement	Expert Systems
<b>10. STAFF DEVELOPS ALTERNATIVES</b>		
10.1 Determine Perceived Situation	Deterministic Processes Pattern Recognition Probabilistic Graphs	Pattern Recognition Probabilistic Graphs
10.2 Use Commander's Guidance	Algorithmic Procedures	Probabilistic Graphs
10.3 Perform Terrain Analysis	Deterministic Operations	Deterministic Operations
10.4 Perform Weather Analysis	Deterministic Operations	Deterministic Operations
10.5 Perform Task Analysis	Algorithmic Procedures	Algorithmic Procedures
10.6 Identify Friendly Doctrine	Algorithmic Procedures	Algorithmic Procedures
10.7 Identify Projected Enemy Reaction	Projecting	

Table 4-1. Planning Requirements Classification (Continued)

PROCESSES AND SUBPROCESSES	FACETS	A.I.
11. STAFF ANALYZES AND EVALUATES ALTERNATIVES		
11.1 Compare Alternatives with Perceived Situation	Deterministic Operations	
11.2 Compare Alternatives with Friendly Doctrine	Deterministic Operations	
11.3 Compare Alternatives with Mission Analysis	Deterministic Operations	
11.4 Compare Alternatives with Terrain Analysis	Deterministic Operations	
11.5 Compare Alternatives with Projected Enemy Reaction	Deterministic Operations	
11.6 Identify Advantages/Disadvantages	Algorithmic Procedures	
12. EVALUATE/SELECT COURSE OF ACTION		
12.1 Compare Courses of Action	Command Guidance Algorithmic Procedures Deterministic Operations	
12.2 Compare Advantages/Disadvantages	Algorithmic Procedures Command Involvement	Expert System
12.3 Prioritize Advantages/Disadvantages	Algorithmic Procedures Command Involvement	Probabilistic Graphs Expert System
12.4 Identify Assumptions	Algorithmic Procedures	

Table 4-1. Planning Requirements Classification (Continued)

PROCESSES AND SUBPROCESSES	FACTS	ALGORITHMIC PROCEDURES	A.I.
12.5 Quantify Uncertainty for Each Course of Action		Algorithmic Procedures Probabilistic Graphs	
12.6 Define Decision Criteria		Command Guidance Algorithmic Procedures Command Involvement	Expert System
12.7 Reduce Uncertainty		Deterministic Operations	
13. PREPARE AND ISSUE INSTRUCTIONS/ORDERS			
13.1 Convert Course of Action into Concept of Operations		Deterministic Operations Information Flow	
14. PROVIDE GUIDANCE			
14.1 Outline Desired Situation		Algorithmic Procedures	
14.2 Specify Conditions Requiring Special Attention of Subordinates		Deterministic Operations	
14.3 Identify Subordinates Affected		Deterministic Operations	
15. STAFF DEVELOPS INPUTS			
15.1 Compare Proposed Course of Action/Projected Enemy Reaction		Deterministic Operations	
15.2 Identify Advantages/Dissadvantages		Deterministic Operations	
15.3 Evaluate Courses of Action		Algorithmic Procedures	

Table 4-1. Planning Requirements Classification (Continued)

In expert systems, the hypothesis whose likelihood is to be formulated at a certain stage of the planning may differ. Thus the inference engine and production rules are used to 'grow' a probabilistic graph for whatever hypothesis must be analyzed. This is an essential difference in the situations requiring expert systems as opposed to merely probabilistic graphs.

#### 4.1.2.19        General Planning Requirements

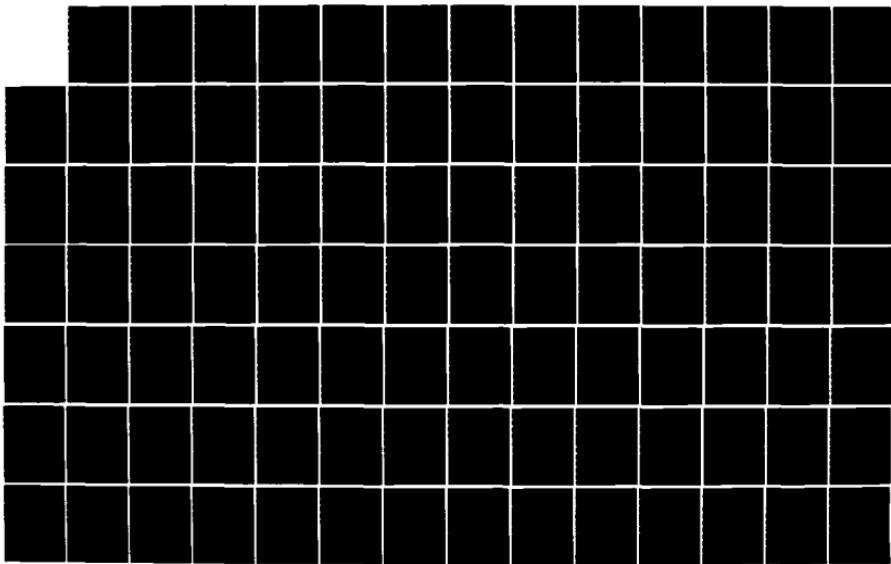
A review of the specific planning requirements discussed above provides insight into the general or global requirements for tactical C<sup>2</sup> planning. These global requirements and characteristics of C<sup>2</sup> planning are presented in the following paragraphs as an augmentation to the previous discussion concerning the planning function.

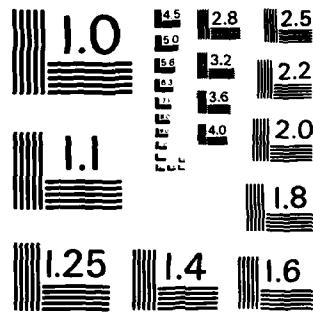
- a) The planning process for Automated CORDIVEM shall provide for the standard five paragraphs of the operations plan: Situation, Mission, Execution, Service Support, Command and Signal.
- b) Plans shall be formed from data concerning mission, enemy, troops, terrain, and time (METT-T); the information will come from higher echelon or be internally generated.
- c) A hierarchy of plans shall be developed to address corps through brigade echelons.
- d) The hierarchy of plans must handle different levels of resolution relative to the same subject area.
- e) The planning shall provide for the flow and processing of information among and within hierarchical levels.

- f) Each plan shall be constrained by, and developed from an input plan from higher echelon.
- g) The planning process shall be interruptible in order to accept new conditions, objectives, and constraints.
- h) Planning at each echelon shall provide mission analysis, development of planning constraints and requirements, i.e., the command functions relating to planning guidance.
- i) Planning at each echelon shall reflect the input of related functional area plans: fire support, combat support, intelligence/EW, air defense, combat service support.
- j) Each plan shall develop subobjectives from more general, higher level objectives (tactical).
- k) Planning shall develop alternative courses of action for the affected units. (NOTE: Decisions associated with alternative plans are a command function as opposed to a staff planning function.)
- l) Planning shall develop advantages and disadvantages for each alternative. This may include "wargaming" of each alternative.
- m) Planning shall distinguish between and appropriately address facts and assumptions.

- n) Planning processes shall include evaluating, selecting, and (if necessary) seeking additional information.
- o) Planning processes shall reflect staff activity.  
(NOTE: Provision shall be made for either a separate planning staff or for utilizing a part of the unit's coordinating/special staff.)
- p) Planning processes shall provide an audit trail which explains what was considered and how it was considered.
- q) Planning shall reflect the interface of staff and command functions.
- r) Planning shall be adaptable to input which provides for planning style and emphasis.
- s) Planning processes shall provide input for the command decision processes.
- t) Planning shall develop threshold flags which denote or connote when a plan is in danger of not being accomplished. That is, in the planning process, the key or critical tactical points shall be identified.
- u) Planning processes shall recognize when to select/adjust/develop a new plan.

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- v) The planning process shall adjust procedures and output to coincide with time available for planning with available resources. This includes estimating lower echelon planning time and estimating time for action (decision point).
- w) Two types of planning related software shall be developed: (1) development of initial plans for input to the combat simulation, and (2) replanning and adjusting the input plan during execution.

#### 4.1.3            Communication Processes

All electromagnetic processes associated with information and data transmission shall be represented in this function. Further, the interface between the information content of the messages and products, and the actual receipt and transmission of the data and information shall be represented. This interface includes the communications personnel, the communication protocols, and any automated assist. It has a direct interface with the physical environment function and the staff process function.

##### 4.1.3.1        Format Message

This subprocess shall provide for all factors associated with the physical preparation of data and information for transmission.

##### 4.1.3.2        Select Means

This subprocess shall provide for all factors associated with priorities, precedence, equipment availability, standard operating procedures, etc.

#### 4.1.3.3

#### Transmit Message

This subprocess shall provide for the physical equipment factors associated with transmitting data and information. It shall contain the following subprocesses:

- 1) Calculate Transmission Factors
- 2) Calculate EW Factors
- 3) Calculate EMP Factors
- 4) Calculate Interference Factors

#### 4.1.4

#### Fight Process

This function shall provide for all combat engagement resolution and attrition processes; movement of units and elements; sustaining of the forces; and mobility, counter-mobility aspects of combat. It shall reflect the most detailed representations of combat forces on the battlefield as they actually exist in the model, i.e., the true ground and air representation. Further, it shall provide for a reporting process (from the lowest resolution units) which loads the command and control staff elements appropriately. It shall reflect the necessary resolution to provide combat activity and attrition processes at a level which provides for distinguishing among combat effects for analysis. The resolution selected in this function is a limiting factor on the total resolution of the model.

#### 4.1.4.1

#### Move Forces

This key subfunction shall provide for moving all elements on the battlefield. It shall develop all parameters which are related to movement that are required by other subfunctions. It shall incorporate considerations for all major factors including the physical displacement of component elements. These component elements include the following: weapon systems, command systems, support systems, and sensor systems. The resolution

of these systems is determined by the specific user requirement identified for the study. The current requirement includes such items as follows:

- o company level maneuver units for Blue, battalion level maneuver units for Red;
- o aircraft sorties for close air and air support;
- o artillery batteries, individual rocket launchers (for special munitions), air defense units;
- o organic communication support centers and relays;
- o main, tactical, and rear command posts (as appropriate);
- o communications support (signal centers, relay stations, ATC stations, trunk/switchboards, signal units);
- o communications equipment (radio, wire, teletype, satellite, messengers, visual, sound);
- o supplies (POL/generators, ammunition, repair parts, food/medical/water, engineering/building, major end items, replacement personnel);
- o supply equipment (transport, maintenance, engineer, medical/services);
- o depots (POL, ASP, FARPs, water tanks, decontamination stations, rail/air fields, food, hospitals);

- o sensors (radars, infrared, sound ranging, image intensification, unattended ground, photographic, SIGINT collectors, observers);
- o sensor centers (data collection, fusion centers).

#### 4.1.4.1.1

##### Prepare to Move

This subfunction shall initiate and incorporate all considerations concerned with delays in initiating physical moves of elements and components. Specific types of considerations shall as a minimum include the following:

- o set up and tear down times as a function of component type, posture, and combat situation;
- o assembly area preparation and planning;
- o deployment delays and processes;
- o alert time provided.

#### 4.1.4.1.2

##### Determine Speed

This subfunction shall compute the movement rate for all elements. It shall incorporate the following factors:

- 1) Vehicle Mix/Unit Type
- 2) Formation
- 3) Relief
- 4) Urbanization
- 5) Roads
- 6) Barriers
- 7) Mine Fields

- 8) Artillery
- 9) Combat
- 10) Smoke
- 11) Debris
- 12) Congestion
- 13) Trafficability
- 14) Atmospheric Condition
- 15) Contamination

4.1.4.1.3      Displacement

This subfunction shall update all data bases with respect to element location/placement.

4.1.4.1.4      Change Situation

This subfunction shall update all data bases with respect to any change in element situation as a result of movement.

4.1.4.2      Engage

This key subfunction shall provide for assessing all combat engagements or scoring processes. These combat engagements shall as a minimum include all major battlefield items: maneuver units versus maneuver units/artillery units/sensor elements/aircraft sorties/support elements; aircraft versus maneuver units/command and control elements/artillery units/support elements/sensor elements; artillery versus maneuver units/command and control elements/artillery units/support elements/sensor elements/aircraft. Collateral damage, battlefield geometry (relative orientation of forces, positions, posture, range, line of sight, terrain), atmospheric conditions (weather, obscuration), fire control, munitions, alert times, and unit mission and activity shall be incorporated. It shall address the following as separate types while incorporating combined effects:

- 1) Direct Fire
- 2) Indirect Fire
- 3) Mine Fields
- 4) Special Ordnance
- 5) Close Air Support
- 6) Air Defense Artillery
- 7) Air to Ground
- 8) Air to Air

#### 4.1.4.3 Sustain

This subprocess shall provide for the following processes related to combat service support:

- 1) Replace
- 2) Repair
- 3) Re-Arm
- 4) Refuel
- 5) Reconstitute
- 6) Decontamination

#### 4.1.4.4 Mobility/Countermobility

This subfunction shall provide for modifying the environmental data base by representing factors associated with the following:

- 1) Barrier Emplacement
- 2) Demolitions
- 3) Fortifications
- 4) Contamination

#### 4.1.4.5

#### Sense the Enemy

This subprocess shall provide for all sensor processes which are not directly addressed in the Engage subprocess. All battlefield items which produce signatures that are detectable by the identified sensors shall be subject to detection, limited only by appropriate phenomena. Identified sensors include as a minimum the following: radars, infrared, sound ranging, image intensifiers, unattended ground, photographic, SIGINT collectors, visual/human. These sensors will be associated with various platforms, e.g., fixed-wing aircraft, helicopters, tracked/wheeled vehicles. This subprocess shall contain the following:

- 1) Scan
- 2) Acquire/Track Targets
- 3) Identify>Select Targets

#### 4.1.4.6

#### Report Generation

This critical subprocess shall represent the doctrinal processes associated with input to the command and control system from the lowest resolution elements represented in the model. It shall provide an accurate representation of the loading on the C2 system as a function of combat events. The following types of input shall be provided:

- 1) Sensor Reports
- 2) Combat Reports
- 3) Administration/Log Reports

#### 4.1.5

#### Physical Environment Processor

A critical aspect of the Automated CORDIVEM is its handling of the physical environment in which combat takes place. This function shall provide for those factors which impact directly or indirectly on all other functions of the model. It is not a model function in the strict sense of

functional definition; however, it shall contain elements which have functional properties. The requirements for model resolution in terms of sensors, weapons, and communications shall determine the resolution in this function. Efficient handling of these requirements will determine the extent to which demanding user requirements related to model size and execution will be met.

#### 4.1.5.1      Terrain

This subprocess shall provide for updating the terrain data base as a function of combat events which influence the following subprocess areas:

- 1)      Relief
- 2)      Urbanization
- 3)      Forestation
- 4)      Rivers
- 5)      Contamination
- 6)      Debris
- 7)      Roads
- 8)      Trafficability/Craters/Nuclear Effects
- 9)      Mine Fields
- 10)     Weather (soil, rivers)

#### 4.1.5.2      Weather

This subprocess shall provide for dynamically modifying weather data bases according to predetermined, time sequenced, algorithmic processes for the following:

- 1)      Clouds
- 2)      Precipitation
- 3)      Wind
- 4)      Temperature

#### 4.1.6

#### Output Requirements

Output files shall be maintained for post-run analysis. These output elements shall be selectable by input parameters. Further, the model shall provide for checkpoint, restart capabilities in which all data parameters are saved off-line at selected time points during execution.

### 4.2

### MODEL PREPARATION

A support software capability shall be developed to aid in model preparation for study execution.

#### 4.2.1

#### Data Base Structure and Update

The input data base structure shall be derived from the combat systems requirements definition structure identified in Section 3 of this document using data management technology such as data description languages and data flow models. These combat systems requirements shall be decomposed to a data element level. This is the level at which data can be used by the model and provided by source agencies. This hierarchical decomposition shall provide traceability from the data item level back to the requirement.

Data elements shall be described in terms of source, definition, and usage in the model. Source identification shall provide the interface within the AMIP community and shall describe approved source and means of transmittal. This process will also identify data voids early in the model design. Approved definitions shall be used to eliminate misunderstandings between data providers and model developers as well as needless data conversions. Usage of data elements within the model shall provide a description of intra-model connectivity as well as inter-model connectivity.

This data design process which produces the data base structure must be concurrent with and interface with the model design process. This process must also be able to respond to changes in requirements such that it identifies new data elements required as well as any impacts on existing elements or connectivities.

Data base management technology shall be used to implement the data structure derived or updated from this process.

#### 4.2.2 Operations Plans

All combat models contain an implicit or explicit operations plan. To accurately reflect the command and control processes which are the essence of corps and division echelon activities, explicit operations plans for both Red and Blue shall be developed and input to the Automated CORDIVEM. A computer assisted model set-up facility shall be developed to aid military analysts in structuring the Red and Blue OPLANs. The assistance shall be of two types: (1) providing the equivalent of staff officers and staff elements in producing estimates of the situation, movement planning, limited wargaming, organizational development, order preparation, etc. and (2) automatic update of model execution files. Such assistance shall include but not be limited to automated processes for the following: interface with the PDL to obtain force structures, terrain analysis (key terrain features, fields of fire, observation, lines of communication), and subsequent model data base update, communication net structuring and model data base update, identification of avenues of approach, initiation of C<sup>2</sup> element intelligence data bases from generalized input, graphic input to model data base of unit dispositions, control measures, barrier plans, fortifications, and graphic display of final model update. Consideration shall be given to graphic input of new terrain data bases and associated terrain related parameters. These initial OPLANs for Red and Blue shall form the basis for the dynamic execution of the command and control processes which shall be contained within the Automated CORDIVEM.

In particular, they shall provide the commander's guidance which will direct the planning processes during dynamic execution.

The "Functional Analysis of Command and Control", CAORA/TR-21/83 identified seventeen processes associated with command and control as seen in Figure 4-2. Since the fundamental activities and actions associated with developing the initial input operations plans are the same as those associated with the dynamic planning in the model, the details of the functions were addressed in the description of the Model Control function which preceded this section. Requirements which are unique to the input process will be addressed in the following paragraphs.

Of particular interest are the needs for graphic display and decision-making support related to establishing the initial states of the seventeen processes needed to develop operations plan modifications. Table 4-2 indicates the types of software support that will be needed to successfully develop the initial states of the seventeen processes.

#### 4.2.2.1      Categories

The table is divided into two support categories: input support and decision aids. The input support category deals with standard mechanisms for inputting modifications to the baseline data used by the simulation. The mechanisms are of three types: graphic display, graphics tablet, and menu.

##### 4.2.2.1.1      Input Support

- a) Graphic Tablets are devices for entering predetermined data into a computer file. Generally the data is graphic or geographic in nature. It is predefined and represented by a symbol on the graphics tablet. This symbol is controlled by a light pen or mouse. The light pen is used to enter data from the graphics

tablet and display it on the screen. Graphic tablets provide direct support of terrain and weather update. They serve to ease the construction of initial unit disposition, control measures, and the emplacement of obstacles (mines, fortification) on the battlefield.

- b) Graphics Displays are computer CRT displays which are painted on the screen. For simulations, these displays are generally representations of the portions of the playing area of the simulation. In addition to the topography, these displays show physical features of the terrain as well as representing units, equipment, and basic infrastructures through military symbols. The graphics display provides immediate feedback of the current state of the scenario development process. As characteristics or conditions are entered, they can be graphically portrayed to assist in the evolution of initial setup parameters. By interconnecting the graphics display with the decision aids software, limited modeling of specific unit or force characteristics can be performed to validate unit behavior. Processes such as terrain analysis, force vulnerabilities, force resources, force capabilities, perceived conditions, and situation assessment can be modeled and graphically portrayed to validate initial positions, postures, missions, and conditions.
- c) Menus are preformatted CRT screens which contain directions for entering data necessary to support a simulation process or task. They serve as a formal mechanism for assuring that data base modification is done within the parameters of the system design. By

restricting access to parameters or requiring that parameters be entered based on system rules, menus assist the user in making concise and complete modifications which are consistent with the existing model representations. Through the use of menu entry of setup parameters, the user can be assured of full and complete coverage of relevant simulation items. By closely coupling the menu entry and edit capability with the decision aids software, the user may validate the impact of entered changes on the structure of the forces to be simulated and, for some characteristics, may project unit behavior to validate modifications.

#### 4.2.2.1.2      Decision Aids

The second category of input is the decision aid. The decision aids are manipulative software tools which provide feedback to the user about various model setup issues. The decision aids software are subsets of the decision-making processes used by the simulation to control the events and activities of the simulation. They serve primarily as editors, predictors, and advisors to the model user to assist in set up of the Initial Operations Plan leaving most sophisticated and inferential alternative evaluation and synthesis to the user.

The decision aids are of three types: forecasting, deterministic, and expert systems.

- a) Forecasting, algorithmic software uses mathematically defined causal relationships to project conditions and events based on input data. For example, given unit speed, terrain, weather, and enemy resistance, algorithmic software can project the location of the unit on a predetermined route over time. The

forecasting algorithms can be used to evaluate individual maneuver characteristics and the impact of modification on a unit structure or decision-making parameters. The forecasting software will predict and display unit movements, speed, possible routes, engagement limitations, probable casualties, when and where contact with the enemy may occur. This software will be useful for forecasting force capabilities, vulnerabilities, mission status, enemy reactions, and situation assessment. It will provide sufficient support to allow the user to identify problems, inconsistencies, and inadequacies in the initial Operations Plan.

- b) Deterministic Processes are mathematical calculations and aggregations necessary to edit and evaluate model parameters associated with deterministic processes. These calculations will provide values such as speed capabilities of various force configurations (given the terrain, equipment, weather, and supply data) maneuver limitations including routes, speeds, material expenditure rates, combat power, combat frontages, postures, and possible missions. Vulnerabilities in the areas of supply, communications, force structure, speed, and maneuver will be identified (as well as capabilities). These calculations will indicate differences between alternative force structures and capabilities required for mission to highlight user modification during setup.
- c) Expert Systems are rule systems which evaluate alternatives using appropriate responses stored in a knowledge base. These systems serve two purposes in

Table 4-2. Model Preparation Planning Classification

PROCESS	INPUT SUPPORT	DECISION AIDS
1. Determine Cognizance/ Information Distribution	Graphic displays, graphic tablets and menu systems shall be utilized to manipulate the basic data input to the simulation environment in the Input Data Base Update function. The support will provide initialization of selected staff and command data bases in the model prior to execution.	Staff responsibilities, products, information flow, and communication nets shall be represented with graphical access by the user.
2. Friendly Force Fusion	Tables of Organization and Equipment, terrain and weather information, and other basic ground truth information shall be accessed through graphic displays, graphic tablets, and menu systems.	Computational algorithms shall be provided in support of force structuring. These aids shall include fundamental characteristics such as speed, firepower, range, sensor capability, etc.
3. Intelligence Fusion	Graphic and menu systems shall support the processing of the selected enemy intelligence data and information provided to the user during set-up. The processed information shall be used to initialize the model data bases.	Computational algorithms shall be provided in support of force structure analysis. These aids shall include fundamental characteristics of systems, organizational templates, and order of battle data.
4. Update Perceived Situation	N/A	
5. Compare Perceived to Desired Situation	N/A	As the user constructs the organization, deployments, etc., this function shall provide the final, composite graphic display and record of the developed scenario. It shall support a check list of all components to be specified by the user.

Table 4-2. Model Preparation Planning Classification (Continued)

PROCESS	INPUT SUPPORT	DECISION AIDS
6. Determine If Change is Required	N/A	N/A
7. Receive and Analyze Mission	This function supports user input of analysis objectives and tactical missions to be accomplished using the model. An initial set of tasks, objectives, and essential elements of analysis shall be outlined. An initial concept of operation shall be input by the user. This input shall direct other simulation environment support functions.	An expert system shall provide user information relating to the model simulation environment structure, aids, and organization. The system shall support user queries concerning aspects of the simulation environment. It shall maintain a checklist of simulation items to address.
8. Restate Mission	This function supports user input to the planning functions and initial data bases of commanders represented in the model.	A menu system coupled with an algorithmic process shall support verification of staff and subordinate command responsibilities.
9. Provide Commander's Guidance	This key function provides a means for providing user determined planning constraints to the model C2 processes. These initial inputs focus and direct all dynamic planning to be accomplished in the model during execution.	A menu system supports user interpretation of the model functions associated with planning.
10. Staff Develops Alternatives	This function shall be utilized to support user development and input of force structures, route selection, movement sequencing, and situation assessment. It shall develop temporary files which shall be used to develop final input operations plans for the selected echelons. It shall provide extensive graphic and menu systems.	Movement planning, terrain analysis, and organizational analysis algorithms shall be provided; these processes shall replicate and provide support similar to general staff functions. Validity checks shall be provided to assist the user in completing a comprehensive alternative. Expert systems shall be used to assess conflicts and inconsistencies in model applications.

Table 4-2. Model Preparation Planning Classification (Continued)

PROCESS	INPUT SUPPORT	DECISION AIDS
11. Staff Analyzes and Evaluates Alternatives	Threat force composition, disposition, and movement shall be supported via graphic systems. These adjustments and manipulations of the threat shall support limited wargaming of operations. This function shall also support recording of advantages and disadvantages of each alternative.	Limited wargaming facilities such as provided in the Commander's Planning Guide shall be provided. An algorithmic process and menu system shall provide access to specific functional areas developed for each alternative. A related aspect of this process shall provide capture of command (user) issues, decisions, and concepts in support of improving expert systems for tactical simulation.
12. Evaluate>Select a Course of Action	This function shall provide graphic aids in reviewing the advantages and disadvantages of the selected alternative(s).	The weighing of advantages and disadvantages shall be assisted by a menu system. It shall also support data collection for expert system development.
13. Prepare and Issue Instructions/Orders	A menu system combined with an algorithmic process shall support transfer of information developed in other functional areas to the final input plan(s). It shall also support the mechanical input of planning information required by the model.	An expert (analysis) system shall support development of the final input operations plan(s) for use in model execution. The support shall include validity and completeness checks as well as an outline of required model inputs.
14. Provide Guidance	N/A	N/A
15. Staff Develops Inputs	N/A	N/A
16. Select/Coordinate Action	N/A	N/A
17. Prepare and Issue Instructions/Orders	N/A	N/A

model setup. One is to evaluate modification for consistency with existing rules and processes; the other is to provide recommendations to the user on strategy and tactics. These recommendations take the form of force structure evaluations, projected enemy response to mission assignments (force postures), likely avenues of approach, required doctrinal response by enemy and friendly troops to specific situations, etc. Expert systems will evaluate modifications in decision rules to determine whether the modification has created a conflict or inconsistency between model processes or within a model process. The system will provide assistance in establishing threshold values for processes such as situation assessment, mission analysis, terrain analysis, resource estimates, enemy or friendly intentions, a problem, opportunities, and course of action development.

#### 4.2.2.2 Specific Functional Requirements

Table 4-2 provides a summarization of the types of support that shall be provided by the Model Preparation Function.

### 4.3 MODEL POST PROCESSING

A computer assisted, model output analysis facility shall be developed to aid military and civilian analysts in interpreting, assessing, and describing data and information associated with the Automated CORDIVEM. Specifically, the facility shall provide support for the following:

- a) Reviewing and comparing any and all selected MOE and MOP from model execution.

- b) Tracing of cause and effect relationships from battlefield events through simulation processes to model requirements without requiring that the analyst have a detailed knowledge of the model or its structure.
- c) Designing, implementing, and assessing the impact of model modifications in order to aid personnel knowledgeable about the model.
- d) Reviewing and comparing alternatives associated with multiple model executions in order to aid personnel with limited knowledge of the model.
- e) Historical and hierarchical analysis of other model results which are related to the Automated CORDIVEM and which are available through the AMIP data base.
- f) Generation of graphic and video material for reports and presentations.

The specific hardware and software to be developed for these functions shall be defined and developed during the specific design and applications of the model.

SECTION 5  
CONFIGURATION CONTROL

5.1           METHODOLOGY

The system shall be developed using a standardized system development methodology.

5.2           SYSTEM DEVELOPMENT CONTROL

5.2.1        Design Procedure

5.2.1.1      Simulation Environment

The proposed CORDIVEM model requires a total simulation environment in order to handle a variety of study and analysis issues. A modular development based on structured design principles is being proposed to ensure the system is flexible and responsive to the varied needs of the modeling community. The issues of precisely defining and binding the problem have been addressed by introducing the concepts of combat system requirements and user requirements. The overall development process is to be iterative in order to achieve a balanced set of user requirements, combat system requirements and functional requirements.

5.2.1.2      Phases

Five system development phases are proposed by JPL which are identical in concept to those set forth in the AMIP software development standards document. However, one additional subphase is being proposed. The technology assessment and directed research tasks in parallel with the development effort require that results be integrated into the system design at one additional subphase. The issue of technological risk is thereby managed in parallel and allows the opportunity to take advantage of research and technological advances.

### 5.2.1.3

#### AMIP Standards

Due to the scope of the project, adherence to the AMIP software development standards, specifically documentation, will occur at both the system level and at the module level, as required by the intent and scope of the individual standards.

### 5.2.2

#### Documentation

##### 5.2.2.1

##### Requirement Definition Document

The Automated CORDIVEM Design Requirements document, consisting of the combat system, user and functional requirements will drive the design effort at both the system and module level. The functional requirements supported by the combat system requirements and user requirements serve as the requirements definition document for the system design. The functional requirements exist as a product of the preliminary system design and address the need of a requirements definition document at the module level.

##### 5.2.2.2.

##### Data Requirements Document

This document shall exist as the compilation of all individual module data requirements; it shall be directly connected to the description of factors contained in the combat system requirements. Preliminary system design results in an initial draft document and continued detailed design of individual modules will result in updates to this document. When proposed during the design phases, data base schema definitions, file descriptions, and common data blocks shall be incorporated into the document to promote data independence, standardization, and consolidation.

#### 5.2.2.3

#### Data Element Dictionary

The use of a data dictionary system shall be developed to facilitate the management of data requirement information during the design and implementation phases and to assist in subsequent modifications. A critical configuration control function is thereby handled for the design, implementation and production phases. Proposed data element or data structure changes can be evaluated in terms of their overall impact on the model in that affected modules can be readily identified.

#### 5.2.2.4

#### Software Design Document (System Design Requirements)

A software design document shall be developed at the system level and also include individual module documentation. At the system level, system block diagrams such as those produced by Problem Statement Language (PSL)/Problem Statement Analyzer (PSA) will identify the overall system structure. At the module level, PSL/PSA or System Document Development Language (SDDL) approaches will be used and will detail the module design to the level required so that coding may proceed. Global or interface data structures will be referenced in the data dictionary while local data may be addressed directly in the documentation.

#### 5.2.2.5

#### Software Implementation Document

A Software Implementation Document shall be developed at the system level in order to give a complete description of the implementation details of the software.

#### 5.2.2.6

#### Installation and Operations Manual

An Installation and Operations Manual shall be developed at the system level in order to give the model set-up and operation aspects that are unique to a specific computer or installation.

A stand-alone section of this document shall detail the operating instructions necessary for the model's execution. Examples of a model's execution will be included.

5.2.2.7            Users Manual

A Users Manual shall be developed at the system level in order to supply the information required to effectively use the model for a specific simulation. The information included shall be methods for model setup, running, and analysis of results, interface techniques such as graphics, input languages and protocols, and output formats. Some model detail shall be required to permit the user to be fully aware of the model's proper uses. Errors and exception messages shall be listed together with the methods of handling. Examples of setups, errors and exceptions, and output results shall be included.

5.2.2.8            Test Plan

A Test Plan shall be developed in order to support systematic developmental testing of the Automated CORDIVEM and its associated Simulation Support Environment.

5.2.2.9            Validation Plan

A Validation Plan shall be developed in order to support a formal validation of the Automated CORDIVEM and its complete hardware and software environment.

5.3                DOCUMENT CONTROL

Centralized document control shall be initiated to synchronize model development and maintenance activities with documentation updates.

Document control shall maintain system documentation including manuals and program source listings, data base schemes and access procedures.

5.3.1                  Program Library Control

All program libraries for the standard production version of the model shall be controlled in a central location. Each source shall be numbered according to version and status. Only current source files shall be maintained in the library. Linkages between programs shall be maintained independently to identify ripple effects of code changes on modules.

5.3.2                  File Maintenance and Modification

File maintenance and modification shall be subject to the previously specified controls for program modules. Further, suggested changes in format shall be validated by reviews as specified under review requirements.

5.3.3                  Data Dictionary and Linkages

Document control shall maintain and update a data element dictionary. Relevant data element linkages will be contained in the data dictionary.

5.4                    DOCUMENTATION PROCEDURES

All documentation shall be developed using automated document development support systems such as PSL/PSA and SDDL.

5.5                    REVIEW REQUIREMENTS

Design reviews shall be conducted upon completion of module design. Should modifications be required as a result of reviews or a change in requirements all affected modules shall be reviewed.

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COMBAT SYSTEM DESCRIPTIONS

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APPENDIX A  
COMBAT SYSTEM DESCRIPTIONS

This major section of the Automated CORDIVEM Design Requirements describes the universe of combat elements, the interactions of those elements, and the environment in which they operate. In the total context of the model development, the descriptions form a centralized reference which provides the particular properties and characteristics of a subset of the virtually unlimited set of all possible Threat and Friendly combat elements and interactions which could be considered in such a model. While recognizing that the Automated CORDIVEM must be general enough to address a wide variety of force structures in a wide variety of scenarios, a particular implementation of the model requires identification and description of specific situations. To this end, the descriptions in this appendix address a typical U.S. Army Corps and a typical Warsaw Pact Front. The descriptions in this appendix have been developed with only very broad restrictions relative to user requirements, e.g., two-sided, force-on-force combat at the U.S. Corps and division level in which combat and system representations must provide for force structure trade-offs and assessments of various strategies and tactical concepts.

A.1 APPENDIX CONTENT

Recognizing the essential nature of command and control at the corps and division echelons, and its fundamental role in determining the results of force-on-force conflicts, the first subsection, pages A-2 through A-121, defines and describes both Threat and Friendly command and control organizations and functions which are critical for consideration in the model. The descriptions are organized according to five combat functional areas: Maneuver, Intelligence/Electronic Warfare, Fire Support, Combat Service Support, and Air Defense. This functional organization accommodates a physical or operational description of the individual military command and control elements and processes. These command and control descriptions are incorporated into the model as described in Section 3, the command and control

interactions and effects portion of the main report. That section of the main report focuses on the manner in which the several elements of command and control relate. Such a representation concentrates on the fundamental dynamic properties of command and control which are of interest in a simulation of combat.

A description of the corps and division is complicated by the dynamic processes associated with organization for combat. The second subsection, page A-122, describes the organic force organization while acknowledging the potential for reorganization for combat. A clear example of such reorganization relates to the signal elements. These elements contain a command and control structure and separate identity in the organic structure but become distributed and reformed as they are attached and assigned for combat. A key feature of this second subsection is the structure that has been developed to facilitate automated handling of the data on force organization for operations plan development during model initialization.

#### A.1.1                   Command and Control

The Joint Chief of Staff (JCS) Publication 1 defines command and control as,

"The exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of his mission. Command and control functions are performed through the management of personnel, equipment, communications, facilities, and procedures which are employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of his mission".

Thus, command and control is the most pervasive element on the battlefield. It is the means by which the diverse human and mechanical combat elements of the two opposing forces are combined into two coherent fighting organizations

engaged in combat on a given terrain. Its dramatic and frequently fragile existence can play an inordinate role in battle outcome. Therefore, for any significant assessment of force-on-force conflict, the components, features, and influence of command and control must be carefully and properly treated; its variability must be understood and correctly controlled within the simulation environment. The following subsections of A.1.1 address the pertinent aspects of Red and Blue command and control to be considered in the development of Automated CORDIVEM.

#### A.1.1.1           Blue Command and Control

As specified in TRADOC pamphlet 525-5 (1981):

"Command control is the process of directing and controlling the behavior of others in order to attain an objective; it includes employment of the physical means involved - the communications, control centers, information-gathering systems, and the staffs and facilities necessary to gather and analyze information, plan for what is to be done, and supervise the execution of what has been ordered. The unique character of command control of military operations is that it must be effective under the extraordinary stress of battle. .... In order to win (the friendly) forces must gain and maintain the initiative, creating opportunities for decisive action which will lead to the collapse of the enemy's fighting ability. ... During both defensive and offensive phases, it is essential that commanders at each level provide their subordinate commanders with sufficient space and time to defeat enemy forces with which they are engaged. In order to do this, each commander must use available firepower and, when feasible, maneuver forces to prevent enemy follow-on echelons from closing into the direct fire battle except at places and times consistent with friendly capabilities."

Command and control (C<sup>2</sup>) responsibilities are distributed among echelons with respect to areas of influence and interest as shown in Table A-1. A commander's area of influence is that geographical region in which the commander can directly influence the outcome of operations by elements under his control; the commander's area of interest includes that geographical region in which the enemy can jeopardize the commander's mission. Distribution of the C<sup>2</sup> responsibilities necessitates integration and unity across echelon command operations. Table A-2 presents a scenario that illustrates such coordination of various command procedures.

Effective C<sup>2</sup> thus demands that:

"Commanders at all levels must understand the higher commander's objectives, concept of operation, and intent well enough to act aggressively and confidently on their own when unexpected situations arise and the next higher headquarters cannot be contacted. Similarly the principal assistants of the commander in his own headquarters must understand the commander's intentions thoroughly so that they can act effectively in his absence."

(FM 71-100, U.S. Army Command and General Staff College, 1983)

At all echelons, command and control requires efficient intelligence gathering, reliable and secure communications network and flexible procedures for formulating and giving orders. Success on the battlefield is achieved by rapidity of coordinated action. This can be obtained only by responsive command and control at all echelons that facilitates execution of the mission, protects the friendly forces, and motivates the individual soldier to fight.

Area of Influence

<u>Level of Command</u>	<u>Time</u>	<u>Approximate Distance Beyond Forward Line of Own Troops (FLOT)</u>
Battalion	0 - 03 Hrs	5 km
Brigade	0 - 12 Hrs	15 km
Division	0 - 24 Hrs	70 km
Corps	0 - 72 Hrs	150 km

Area of Interest

<u>Level of Command</u>	<u>Time</u>	<u>Approximate Distance Beyond Forward Line of Own Troops (FLOT)</u>
Battalion	0 - 12 Hrs	15 km
Brigade	0 - 24 Hrs	70 km
Division	0 - 72 Hrs	150 km
Corps	0 - 96 Hrs	300 km

Table A-1. Command and Control Responsibilities

Echelon Hrs. to Close-In Battle	Corps	Division	Brigade	Battalion
72 Hr	Plan and execute preparations for corps maneuver, fires, deep attack, etc.			
24 Hr	Deploy air and tactical nuclear weapon systems.	Assess threat vulnerabilities and avenues of approach.		
12 Hr	Integrate land weapon systems to isolate one part of battlefield.	Acquire targets. Execute interdiction attacks. Support FLOT battle.	Anticipate threat; anticipate needs for resources and fires.	
0 Hr	Disrupt enemy reserves.	Concentrate power at critical area.	Coordinate combined arms teams (tank, infantry, attack, helicopters, etc.	Appraise battle ground geography, contact enemy, direct arms teams.

Table A-2. Distribution of Command and Control Responsibilities Across Echelon Command Operations

The following outline details how C<sup>2</sup> processes operate within specified functional areas. At each echelon facilities, equipment, staff, and procedures are described in relation to the command and control operations. The above discussion characterizes the structure and elements of the C<sup>2</sup> process that permeate all functional areas.

A.1.1.1.1        Maneuver Control

Maneuver control processes follow a fairly structured echelon dependent hierarchy. Liaison officers from other functional areas provide maneuver commanders and staff with ready access to combat resources.

A.1.1.1.1.1        Corps Echelon

Corps echelon units of control are the main and rear command posts (CPs). A tactical (forward) CP may be available but it serves primarily as a backup for the main CP.

A.1.1.1.1.1.1        Corps Main Command Post

The main CP contains the staff elements that allow the commander to see the battle, allocate resources, and position combat service support.

A.1.1.1.1.1.1.1        Physical Facilities and Movement

The main CP is generally located about 30 km behind the forward line of own troops (FLOT). The CP is 100% mobile. The corps CP uses its own staff and organic vehicles to displace. Survivability of the CP is enhanced by masking of communications. The C<sup>2</sup> physical apparatus is divided by function into various cells where a minimum of .5 Km is maintained between cells to increase survivability against non-nuclear devices. For the corps main CP, functional cells may include a command cell, a battle coordination

cell, an intelligence fusion cell, a fire support cell. Further, specific elements may include the signal center, medical units, and air transport center.

A.1.1.1.1.1.2 Communications

The corps main CP employs signal personnel from units available to the corps in support of satellite, multichannel, and radio teletype (RATT) systems as well as tactical radios and messengers to provide communications. Personal interaction between commander and staff is accomplished by use of a closed circuit television system. According to TRADOC pamphlet 525-5:

"The communication system will be capable of providing the commander:

- (a) Timely information
- (b) Means for staff coordination.
- (c) Means of passing guidance and orders to subordinate commanders.
- (d) Electronic countermeasure resistant system.
- (e) Redundancy to accept damage and continue to operate. Redundancy will be achieved by the use of state-of-the-art equipment consisting of:
  - 1. Automatic circuit and message switching of telecommunications.
  - 2. SINCgars radios equipped with COMSEC device.

3. Single channel Tac SAT.

4. Tactical Record Traffic Facsimile.

(2) Communication with Allied/NATO organizations will be established through the use of the NATO interface unit. This equipment will provide the interface for the corps communications into the allied/NATO system. Communication liaison teams from the corps Signal Brigade equipped with improved high frequency and SINCGARS radios will enhance the capability of the interface equipment."

A.1.1.1.1.1.3 Personnel

Personnel at the corps main CP include the commander, corps chief of staff, representatives from G1 through G5, air force liaison, civil affairs (CA) individuals, and communications personnel. Personnel operations are split into two 12 hour shifts. Other personnel at corps main CP may include military police and medical elements.

A.1.1.1.1.1.4 Battle Planning/Situation Assessment

The corps is the primary center for nuclear fire planning, integration of air-land forces and coordination with other friendly forces. The corps main CP staff assesses the corps strength, location, and materiel.

1) Strength is concerned with how many personnel per unit are available to conduct combat operations and what units require replacements. Strength information may be utilized in allocation of forces and establishing priorities for replacements. Strength assessment will also consider morale and health of personnel.

- 2) Location of units is concerned with where subordinate units are currently located, whether they can perform their mission there, whether they can be easily relocated, etc.
- 3) Materiel is concerned with whether units are properly supplied or their equipment is in adequate state to permit them to conduct combat operations. This can influence allocation of forces.

A.1.1.1.1.1.5 Command and Control

As outlined in the FAROs (1982):

"In the exercise of command and control over the corps level combat action units, the Corps Main CP [corps commander] makes the following range of decisions:

- o The broad positioning of major action units
- o On-going adjustments to resource allocation, scheme of maneuver and task organization of major action units
- o Movements are planned and coordinated for major action units and their associated ADA and combat support elements.

In making these decisions, the Corps Main CP considers the following:

- o The corps commander's guidance
- o Mission tasking from corps OPORD in effect

- o Action unit status reports from division Main CPs, ACR/Aviation/Separate Brigade Main CPs
- o Reported intelligence, weather, and terrain from Corps I/EW elements and EAC sources
- o Combat information from corps level action units
- o Requests for support from corps level action units and division Main CPs."

The corps commander makes corps level decision on air defense, battle support and resupply, counterfire, force movements, disruption of threat forces, intelligence, surveillance and target acquisition, weather and terrain analysis, position fortification, recovery/maintenance of units, and health services.

In relation to effects on the C<sup>2</sup> processes of other echelons, two corps C<sup>2</sup> elements are particularly noteworthy. First, the corps commander and staff control the amount of time subordinate units and elements have available to plan and prepare to conduct an operation. This includes issuing orders, making estimates, conducting reconnaissance, and moving units.

Also, when the corps commander allocates forces to division control:

- 1) The commander explicitly and implicitly establishes chains of command.
- 2) The commander establishes command relationships by how he allocates forces (e.g., assigns, attaches, direct support, general support, etc.) and places constraints on how the forces can be used.

- 3) The commander establishes basic tactical grouping to accomplish assigned missions when units are allocated to division control.

Note that these elements of C<sup>2</sup> are inherent in command processes at all echelons. The effect of corps command decisions filters down to all lower echelons.

A.1.1.1.1.1.2     Corps Aviation Brigade Main CP

The corps aviation brigade is the parent organization for corps aviation units such as the corps Attack Helicopter Battalion. The command post is located within the corps main CP.

A.1.1.1.1.1.2.1     Command and Control

The corps aviation brigade commander is responsible for determining the placement of corps aviation brigade combat and reconnaissance/surveillance (R/S) tasks, plans future aviation operations and determines the resources required to complete aviation missions. The commander is assisted by his staff.

A.1.1.1.1.1.3     Corps Tactical CP

When employed, the corps tactical CP serves as an intermediate corps main CP for the purpose of situation assessment and movement. The tactical CP acts as an alternate main CP when loss, damage, or displacement of the main CP occurs. It is located forward near the division main CP and maintains a small complement of senior coordinating staff with minimal physical facilities.

A.1.1.1.1.4      Corps Rear CP

The corps rear CP maintains the capability to duplicate the main CP in both function and personnel. The rear CP is most heavily involved in reconstitution efforts. TRADOC pamphlet 525-5 describes reconstitution as follows:

"Operations include resupply of all classes of supply, evacuation, recovery/maintenance, health services, personnel management, sustaining services, and those extraordinary measures taken to quickly restore a depleted unit to an acceptable level of combat effectiveness by critical personnel replacement."

Activities most directly associated with administrative and combat service support are located at the rear CP.

A.1.1.1.1.4.1    Physical Facilities and Movement

The corps rear CP employs all survivability features of the main CP. Additionally, the rear CP is at least 15 km further behind the FLOT than the main CP. The commander positions the rear area operations center (RAOC) in a location that facilitates the unity of planning, coordination, supervision, and execution of rear area combat operations (RACO); possibility of enemy threat must be considered in locating and securing the RAOC.

A.1.1.1.1.4.2    Personnel

The rear CP personnel is headed by the corps deputy commander.

A.1.1.1.1.1.4.3 Battle Planning/Situation Assessment

The rear CP personnel assists the main CP personnel in planning and assessment by maintaining pertinent data in readily accessed computers.

A.1.1.1.1.1.4.4 Command and Control

From the FAROs (1982) :

"The Corps Rear CP [commander] makes the following range of decisions in RACO planning/direction and Reconstitution Planning/Coordination:

- o Resource allocation to the force designated as the rear area security element
- o Requests to Combat Service Support (CSS) functional area and Echelons Above Corps (EAC) sources of supply for personnel replacement, major end item replacement/ maintenance, medical evacuation.
- o Coordination of refugee movement and traffic control in the corps rear area

In making these decisions, the Corps Rear CP considers the following:

- o Corps Operations Order (OPORD) in effect
- o Corps commander's guidance
- o Major action unit status reports from the Corps Main CP

- o Reported intelligence, weather and terrain from I/EW elements at Corps Main CP."

A.1.1.1.1.2      Division Echelon

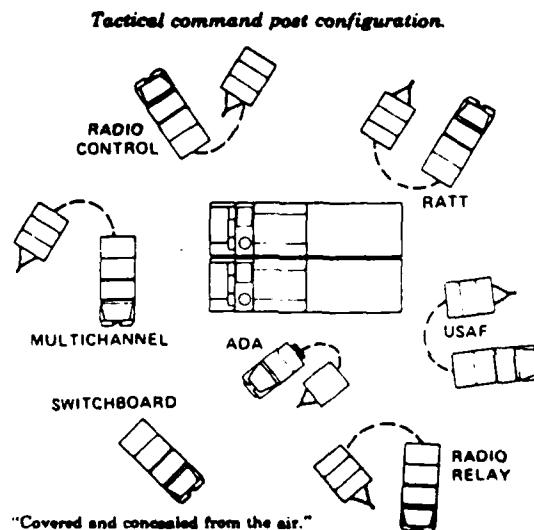
Division units of control include the tactical division CP (Tac CP), the division main CP and the division rear CP. Survivability of the C2 functional area is improved by separating it into three elements.

A.1.1.1.1.2.1      Division Tactical CP

Division control of the battle is normally exercised at the Tac CP.

A.1.1.1.1.2.1.1      Physical Facilities and Movement

The Tac CP is located well forward of the main battle area and usually operates from a minimum number of vehicles concealed by the natural terrain. The Tac CP is completely mobile and maintains full capacity while moving.



No security element is organic to the division Tac CP.

#### A.1.1.1.2.1.2 Communications

The Tac CP is located within FM range of the division's forward brigades. Two secure FM voice nets are maintained, one provides a dedicated intelligence net and the other, a command operations net. Communication support is provided to a platoon from the command operations company of the division signal battalion. This platoon is capable of operating 24 hours a day. Communication security is very important. Training circular 101-5 states:

"In order to reduce vulnerability to ECM (electronic countermeasures) and increase command post survivability, the commander and his staff must reduce the electronic signature of the command post by:

- o Prudent distribution of equipment, to include remoting antennas, and the use of directional antennas whenever possible.
- o Stressing communication security, with particular emphasis on limiting traffic and on radio/telephone discipline."

#### A.1.1.1.2.1.3 Personnel

To improve Tac CP mobility, the CP personnel is streamlined. During intense fighting, the division commander and a minimum of staff are located at the Tac CP. The staff includes G1, G2, and G3 representatives and fire support, air defense artillery and air force tactical air control party officers. Staff functions are to gather information, anticipate significant factors that may affect the tactical situation, to recommend actions, disseminate commander orders, and to exercise authority delegated by the commander. Flexibility in staff procedures enhances command process efficiency.

#### A.1.1.1.2.1.4 Battle Direction/Situation Assessment

The division Tac CP has responsibility for the direction of the immediate battle and must maintain an up to date evaluation of the situation. This function is performed solely by the commander and his staff. The commander and staff assess the following:

- 1) Force Organization: the organization of brigades in terms of combat capabilities. In general, brigades may be tank heavy, infantry heavy, balanced or have some special capabilities.
- 2) Mobility: the routes available for movement and the possible rates of movements for various combat units.
- 3) Placement: locations where terrain can increase favorable tactical formation.
- 4) Timing: the time controls that must be imposed to assure the coordination required to concentrate forces at desired times and places.
- 5) Coordination: the ensurance that subordinate units mutually support each other and avoid conflict with each other.
- 6) Force Commitment: the decisive commitment of reserves at critical points and times.
- 7) Weather/Visibility: the ability of weather conditions or limited visibility to increase effective combat power.

A.1.1.1.2.1.5 Command and Control

The FAROs (1982) state:

"The range of decisions made by the Division Tac CP include:

- o On-going adjustments to resource allocation to brigades in support of the immediate battle (directives sent to divisional action units and brigade Main CPs involved)
- o Positioning of divisional R/S (reconnaissance/surveillance) action units (cavalry squadron TOCs [tactical operations center])

The Division Tac CP considers the following in making these decisions:

- o Division OPORD in effect
- o Division commander's guidance
- o Disposition of corps R/S assets (ACR [armored cavalry regiment]) (from corps main CP/OPORDS)
- o Action unit critical status reports (from brigade main CPs and cavalry squadron TOCs)
- o Requests for immediate support (from division action units and brigade CPs)
- o Combat information of immediate concern (from corps/division main CPs)

- o Reports on operations of brigades to the side of the area of immediate concern to the division Tac CP (from the division main CP)"

#### A.1.1.1.1.2.2    Division Main CP

The activities that sustain the division are conducted in the division main CP. If the division Tac CP is destroyed, the main CP serves as an interim Tac CP.

##### A.1.1.1.1.2.2.1    Physical Facilities and Movement

The division main CP is located at least 30 km from the forward edge of the battle area (FEBA), outside the range of enemy artillery. The division main CP has a rapid displacement capability.

##### A.1.1.1.1.2.2.2    Communications

The main CP has a signal center which includes satellite, multichannel, and RATT systems supported by personnel from assigned signal units. The main CP also has available messengers and tactical voice radios.

##### A.1.1.1.1.2.2.3    Personnel

The division main CP personnel includes approximately 250 individuals. The chief of staff normally exercises control of the main CP. The staff consists of G1, G3, and G4 elements; the majority of the G2 section resides at the main CP. Officers from air defense artillery, aviation, fire support element and counter battery radar, a tactical air control party element, staff from the Army security agency, and the combat intelligence company and a military police platoon are located at the main CP.

A.1.1.1.2.2.4 Battle Planning/Situation Assessment

The division commander uses his staff and computer assets to plan for the future battle and situation. Personnel at the main CP are responsible for taking the broad guidance of the division commander and the current corps operations order and developing from these inputs an operational plan for the division.

A.1.1.1.2.2.5 Command and Control

The division commander makes decisions concerning:

- 1) Resource allocation
- 2) Task organization down to the battalion level
- 3) Scheme of maneuver
- 4) Air defense artillery combat support.

A.1.1.1.2.3 Division Rear CP

The rear CP personnel perform combat service support functions that require close coordination with division support command (DISCOM), counterintelligence and prisoner of war interrogation, administrative support functions, and provide airlift support information.

A.1.1.1.2.3.1 Personnel

In the rear area, GI personnel supply staff support for the maintenance of morale, health services, and the maintenance of discipline, law and order. The G2 counterintelligence and interrogation element is located at the rear CP. The G5 section which coordinates civil/military operations has its staff at the rear CP. Medical elements may also be located in this area.

A.1.1.1.1.3

Brigade Echelon

According to FM 71-100, U.S. Army Command and General Staff College:

"Under ideal conditions, the organization of the brigade command and control elements include a main command post, a tactical command post, and a rear area. At times, a small command group operates independently. However, due to armored vehicle, personnel, and equipment limitations, it is not possible for more than two (elements) of command to operate effectively and to be sustained for a great period of time."

A.1.1.1.1.3.1

Brigade Tactical CP

A brigade Tac CP is employed during the key phases of a battle that require additional control. When the brigade main CP is displacing, during a river crossing or passage of lines, or when the disposition of brigade units requires optimal communications, the brigade commander may establish a Tac CP. A Tac CP may also serve as an alternate command and control facility in the case of brigade main CP destruction.

A.1.1.1.1.3.1.1

Physical Facility and Movement

Usually limitations of equipment and personnel restrict the Tac CP to one armored vehicle. The brigade Tac CP is fast-moving and the movement is determined by the flow of the battle and desires of the commander.

A.1.1.1.1.3.1.2

Communications

Brigade Tac CP devotes its communications assets to maintaining communication with the brigade main CP, battalion headquarters,

and possibly, the division Tac CP. If required, a multichannel unit displaces with the Tac CP.

A.1.1.1.3.1.3 Personnel

In keeping with the temporary, mobile characteristics of the brigade Tac CP personnel, normally consists of the brigade commander, the operations training officer (S3) who supervises the execution of operations, a representative of the fire support element, and one non-commissioned officer (NCO).

A.1.1.1.3.1.4 Battle Direction

Planning, direction, and command and control at the Tac CP is similar to that at the brigade main CP (Sections A.1.1.1.3.2.4, A.1.1.1.3.2.5). Additionally, employment of a Tac CP places the commander in face-to-face contact with subordinate commanders, enhancing the communication of orders and information as well as increasing lower echelon morale.

A.1.1.1.3.2 Brigade Main CP

The brigade main CP serves primarily as a communications, information, coordination and planning center in support of the near-term battle. As described in FM 71-100:

"Brigade command and control is done primarily through a main command post. For security, only essential elements are located in this command post. It consists of those coordinating and special staff personnel and representatives from the division or other units necessary to carry out combat operations. It is concerned with the activities required to sustain current operations and plan for the future. This includes intelligence production,

receiving, and processing as well as submitting required reports to higher headquarters."

A.1.1.1.1.3.2.1 Physical Facilities and Movement

The main CP usually consists of five armored vehicles dispersed over approximately .5 sq Km. One vehicle is allocated to each of the S2 (intelligence information), S3, and fire support elements. One vehicle serves as a communications center and the fifth is used when a Tac CP is established.

A.1.1.1.1.3.2.2 Communications

When possible, communications with the division are made on the secure FM division command and intelligence nets. Non-secure single side band (AM) communications are also possible over the division net. The brigade main CP communicates with subordinate units over the secure FM brigade command net. Multichannel voice communication facilities are augmented by RATT nets. The enemy uses sophisticated ECM to detect the main CP. Hence, the commander and his staff must reduce the electronic signature of the CP. To accomplish this reduction, the following measures are employed.

- "1) Use of directional antennas.
- 2) Establishing reserve equipment.
- 3) Three or more frequency and call-sign changes per day.
- 4) Maximum use of remote radio operations.
- 5) Changing radio operators concurrent with frequency changes.

- 6) Dispersing the division cavalry squadron vehicles through the division and communicating only on the cavalry squadron radio net as a deception measure.
- 7) Careful planning of CP and communications site locations, displacements, and the use of terrain masking techniques.
- 8) Message-shortening techniques.
- 9) Stressing communications security, with particular emphasis on limiting traffic and on radio/telephone discipline."

(Quoted from FM 71-100.)

Proper implementation of electronic counter-countermeasures can result in a main CP electronic signature which is similar to the electronic signature of a support activity.

#### A.1.1.1.3.2.3 Personnel

Most of the brigade staff operates from the brigade main CP. The brigade staff plans and supervises the brigade tactical operations and monitors brigade combat support needs. The staff includes S2, S3, fire support, chemical and radiological sections, combat electronic warfare, intelligence, tactical air control party and engineer elements. Except for scope, the responsibilities of the brigade personnel are similar to their counterparts on the division staff.

#### A.1.1.1.3.2.4 Battle Planning/Direction/Situation Assessment

At the brigade main CP, staff make contingency plans for modification of fire support and movement of forces, anticipate logistic

requirements, assess the need for commitment of reserves and shifts in the main effort, and provide direction for engineer and air defense support. In planning and assessing, early staff involvement, speed and coordination are vital to success. The staff must anticipate the dispositions necessary to exploit success or to withdraw forces if necessary.

#### A.1.1.1.3.2.5 Command and Control

The brigade commander determines the task organization for brigade units, and allocates fire support, air defense, tank or infantry platoons, etc. to battalion task forces. In making these decisions, the brigade commander considers his assigned mission, enemy forces likely to be encountered, the terrain and the resources available to the brigade.

#### A.1.1.1.3.3 Brigade Rear Area

In FM 71-100, the brigade rear area is described as follows:

"The brigade support area is located well to the rear and may be located behind the brigade rear boundary. The brigade rear area provides the combat service support functions required to support the brigade. The brigade S4 is responsible for the operation and displacement of this echelon. The S1 and S4 maintain continuous contact with the brigade executive officer located at the main command post to insure the adequacy of combat service support operations. The forward area support team, or the forward support battalion CP, from the division support command is also located in this support area and provides support to the brigade units. This support team or battalion CP locates and displaces according to the directions of the brigade S4. Other units located in this rear area are the brigade headquarters company minus prisoner of war interrogation teams, military police, civil affairs personnel, and any

other supporting units that are not necessary in the forward area. The brigade S4 establishes the rear area security net."

#### A.1.1.1.1.4

#### Battalion Echelon

At the battalion echelon, command and control consists of a commander and single staff. Battalion command is a highly personalized function in which the commander controls the interaction of his weapons with the terrain and the enemy. He sees the enemy and his company, issues orders orally, directly and face-to-face whenever possible. The commander performs his function under very difficult battle conditions. Tactically skillful battalion commanders are essential to the force's combat effectiveness.

#### A.1.1.1.1.4.1

#### Personnel

The battalion is the first tactical echelon with a staff. In addition to the battalion commander, the staff consists of S1 (personnel), S2 (intelligence), S3 (operations), and S4 (logistics) elements. A fire support officer frequently works closely with the commander or S3 personnel. The command sergeant major advises the commander on matters concerning the enlisted ranks.

#### A.1.1.1.1.4.2

#### Battle Planning/Command and Control

In planning and assessment, the battalion commander works to maximize the effectiveness of the available weapons. Key issues considered by the battalion commander are described in FM 71-2:

- "o Can I significantly improve the mutual support of infantry, tanks and TOW within the teams by changing the task organization?

- o Is the task force or one of the teams about to face a significantly different situation requiring a different balance of these components? (For example, approaching a town, clearing woods, cleaning out a trench line, approaching a stream, moving into the lead, defending in the open, defending in the woods, etc.)
- o Can I help a team break contact or attack a position by sending another tank platoon or mech platoon?
- c Besides the three chief components, should I reassign or redirect the efforts of my other combined arms assets? (Mortars, artillery, TACAIR, attack helicopters, scouts, AVLB, engineers, air defense, combat service support.)"

Battalion commanders plan for use of terrain characteristics to develop a favorable combat power factor. This is accomplished by assignment of avenues of approach; assigning priorities of avenue use to subordinate; assigning routes of advance or reconnaissance to certain units; assigning operational sectors with advantageous cover and concealment features; making use of terrain features that favor observation of the enemy; assigning units to sectors that provide good fields of fire support or conduct the operation; planning for use of obstacles or barriers to hamper, contain, or canalize enemy forces; use of terrain features that enhance the security of operational area (e.g., forward, flank, and rear security; give adequate warning of enemy approach, etc.). Battalion commanders assign company missions, prioritize fire support targets, and allocate battalion resources.

A.1.1.1.2        Intelligence/Electronic Warfare Command and Control

Given a scenario in which friendly forces are outnumbered and outgunned, it is critical that friendly tactical commanders have access to intelligence/electronic warfare (I/EW) elements. The need for speedy collection and dissemination of combat information, all-source data processing and integration, and central direction of EW effort dictates the need for a single I/EW element. Though I/EW mission planning normally originates at the division, commanders at all echelons must understand and use the combat power of I/EW resources. Combat operations in the sophisticated I/EW environment demands close and continuing coordination of I/EW staff at all levels.

A.1.1.1.2.1      Corps Echelon

To be effective in combat, the corps commander must have information about enemy strengths, location, direction of attack, areas selected for enemy defense and the enemy's ability to conduct combat operations. The corps combat electronic warfare intelligence (CEWI) group provides this support in three basic disciplines: electromagnetic, imagery, and the collection of information by human sources (HUMINT). Command and control for the CEWI group is located at the group headquarters. Intermediate group headquarters are employed for tactical purposes.

A.1.1.1.2.1.1     Corps CEWI Headquarters (Corps Mission Management Element)

The corps commander establishes the command relation between the corps and the CEWI group which is represented by the CEWI group commander. Usually CEWI group missions are under the direction of the corps commander and the corps G2 staff which integrates intelligence with tactical operations.

#### A.1.1.1.2.1.1.1 Physical Facilities and Movement

CEWI headquarters are located at and move with the corps main CP. Equipment for the corps Special Security Office (SSO) is a part of this headquarters.

#### A.1.1.1.2.1.1.2 Communications

Communications has an important role in the CEWI group. In addition to the usual communication lines provided by the corps signal brigade, certain dedicated and secure lines are identified for the CEWI group. FM 11-92 describes the CEWI communication assets as follows:

"The CEWI Gp has organic communications to provide the flexibility needed to support operations throughout the corps and to maintain communications during highly mobile operations. Within the CEWI Gp's elements, unit headquarters function as the focal points for the command and control nets, while the intelligence element of the TOC (tactical operations center) functions as the focal point for tactical control tasking, collection management, processing, and reporting.

CEWI Gp units are equipped to operate radio teletypewriter (RATT), FM secure voice, and amplitude modulated/single sideband (AM/SSB) radio nets. RATT is used during the initial occupation of positions; to augment circuits during outages; and to carry the traffic overloads.

FM secure voice is used as the primary means for command mission communications in many of the forward elements of the CEWI Gp. AM/SSB provides long-range voice communications between the various G2 elements deployed throughout the corps and division battlefield."

#### A.1.1.1.2.1.1.3 Personnel

The CEWI group functions under the supervision of the group commander. The CEWI headquarters provides personnel to assist the corps G2 personnel in staffing the corps' main CP and tactical CP. Its personnel also will man the intelligence centers of the air defense artillery group, the corps support command and the corps rear area operations support center. A 17-man U.S. Air Force Weather Section is attached to the CEWI group. Assets involved in the intelligence collection process include the G2 mission management and dissemination section (MMDS) staff and the technical control and analytical elements (TCAE) staff. For intelligence collection and fusion, the G2 MMDS staff is assisted by computers. For EW operations, TCAE staff and the single source analytical team for SIGINT (enemy signals-communication, electronic and telemetry-intelligence) are assisted by computers.

#### A.1.1.1.2.1.1.4 EW Mission Assessment and Control

The corps must have the capability to jam targets within the corps area of influence, approximately 150 km beyond the FLOT. The corps EW command directs and evaluates jamming operations (assigned by the corps commander) to insure the integration of jamming with intelligence collection, fire support, and maneuver control. Coordinated employment of jamming, artillery, and air support is capable of disrupting or neutralizing about 50% of the enemy's critical C<sup>2</sup> systems.

#### A.1.1.1.2.1.1.5 Intelligence/Surveillance Mission Assessment and Control

The corps CEWI group provides first-echelon integration of intelligence from national and tactical systems. The CEWI intelligence operations respond to immediate intelligence needs of the corps commander and the collection request of the corps G2 staff. The corps intelligence group receives information from:

- 1) Subordinate divisions
- 2) Corps cavalry
- 3) Corps electronic warfare intelligence units
- 4) Corps air defense groups
- 5) Adjacent corps
- 6) Tactical air reconnaissance
- 7) Echelons above corps (EAC) - to include national systems

As stated in TRADOC pamphlet 525-5:

"Corps must rely on EAC, Air Force, and national levels capable of developing intelligence to depths of 300 km forward of the FLOT. The corps coordinates the tasking of EAC, USAF, and national systems to satisfy division essential elements of information (EEI). The division must also provide combat information and intelligence to corps based on the corps commander's EEI..."

Dynamic (intelligence) collector management ensures continuity of operations while enhancing sensor survivability. Through a centralized management and control mechanism, ISTA (intelligence, surveillance, and target acquisition) collectors will interface with and complement collectors of adjacent corps, EAC, Air Force, and national systems."

The CEWI command provides this management by allocating, positioning and tasking its own sensor assets to complement intelligence requirements. The CEWI command decisions reflect the type of information required and the time available for data collection and fusion. Intelligence summaries produced by the CEWI group feed back information to the corps commander and/or G2 staff.

A.1.1.1.2.1.1.6 Operations Security (OPSEC) Support

OPSEC identifies friendly vulnerabilities to the enemy collection system. CEWI recommends countermeasures and provides support for deception planning.

A.1.1.1.2.1.2 Corps Intermediate Headquarters

From the FAROs (1982) :

"Several intermediate headquarters exist at corps which are considered as C<sup>2</sup> assets in this representation. In the CEWI group at corps, there is the Tactical Exploitation Battalion, the parent unit for ground sensors and jammers. The Aerial Exploitation Battalion serves the same role for aerial sensors and jammers. Should long range reconnaissance patrols be tasked once again as an I/EW function, the parent unit would be the Ranger Battalion at corps. Parent units provide resupply, maintenance, and admin/log support for the functions being performed. While they keep detailed accounts of the systems locations and status, they are not specifically charged with developing tasking for individual missions."

A.1.1.1.2.2 Division Echelon

Organic to each division is a CEWI battalion. The U.S. Army Command and General Staff College Subcourse 1/0 Outline gives the following outline for the CEWI battalion:

"(The CEWI battalion) of each division will be employed to provide direct support to the committed brigades or general support to the overall division. Under certain circumstances, it will provide elements to be attached to

maneuver units of the division or placed under the operational control (OPCON) of various commanders. The CEWI battalion will be employed to provide multidisciplined, task-organized support tailored to the commander's concept of the operation. ... The relationship of the battalion to the division coordinating staff and command group is the same as that of other battalions in the division base. The CEWI battalion, like the division engineer or the signal battalion, provides close and continuous combat support to the units of the division. The battalion responds to missions developed by the G2 and G3. The battalion commander is responsible to the division commander for command matters, including advice on how to employ his unit. The G2 however, is the principal advisor to the division commander on the enemy's capabilities and intentions."

Command and control for the division's CEWI battalion is located at the CEWI battalion headquarters, called the Battalion Operations Center (BOC).

A.1.1.1.2.2.1      CEWI BOC (Division Mission Management Element)

The CEWI BOC provides centralized, integrated, all-source EW and intelligence management, analysis, and reporting. The CEWI BOC administers the CEWI collection and jamming, ground surveillance and service support companies. The BOC is located at and moves with the division main CP.

A.1.1.1.2.2.1.1    Communications

The CEWI maintains dedicated communications nets with the division main CP, Tac CP, brigade main CPs, the division artillery squadron and the armored cavalry squadron. Communications assets include tactical radios (dedicated channels are established to provide time-sensitive

information directly to the CEWI battalion personnel), the division multichannel signal center (an asset of the division main CP), and messengers.

A.1.1.1.2.2.1.2 Personnel

The CEWI battalion is administered by a battalion commander who responds to the division commander. The battalion has S1, S2, S3, and S4 staff elements. The S1 staff perform administrative and managerial services. The S2 staff oversees the battalion security; in particular, S2 personnel establish procedures governing the emergency destruction or evacuation of the division's special intelligence (SI) holdings. The S3 staff manages the CEWI battalion assets and the S4 element is responsible for logistic operations. Division G2 staff is not organic to the CEWI battalion but rather advises the CEWI battalion on division intelligence needs.

A.1.1.1.2.2.1.3 Battle Assessment

The CEWI battalion performs the following I/EW battle assessment operations:

- 1) Fusion and dissemination of all-source intelligence, managed at the division's semiautomated all-source analysis center (ASAC).
- 2) Integration of tactical counterintelligence and signal security OPSEC support.
- 3) Imagery interpretation (IT) (for OPSEC support).
- 4) Support of specialized intelligence elements for the USAF weather section and terrain analysis teams.

In performing these functions, the CEWI battalion routinely interfaces with the division tactical operations center (DTOC) for mission

tasking, information exchange and status reporting. The battalion commander continually evaluates the effectiveness of the battalion's all-source analysis procedures, dissemination of combat information and intelligence to fire support and maneuver elements, and integration of electronic warfare planning into the division and brigade scheme of maneuver.

A.1.1.1.2.2.1.4 Command and Control

The CEWI battalion commander controls the execution of missions required to satisfy the division G2 staff and division commander intelligence and operations security needs. The battalion commander makes decisions:

- "1) Insuring that CEWI assets are employed to provide OPSEC, EW, and intelligence support to the division headquarters, maneuver brigades, maneuver battalions, and other subordinate headquarters of the division in accordance with the division OPORD/OPLAN.
- 2) Providing administrative, logistic, and operational directives to the subordinate elements of the battalion.
- 3) Advising the division commander/G2/G3 on the most effective use and employment of battalion assets."

(Quote from U.S. Army Command and General Staff College Subcourse 1/0 Outline.)

A.1.1.1.2.3 Brigade Echelon

The brigade does not have organic I/EW elements. However, the brigade S2 staff coordinates with the brigade S3 staff and division I/EW staff to provide for the brigade's intelligence collection and jamming

requirements. Also, it should be noted that in an intense battle, the brigade commander frequently becomes personally involved in the gathering of combat intelligence.

A.1.1.1.2.3.1      Brigade S2 Staff

The S2 staff provides the brigade with combat intelligence. Combat intelligence is the knowledge of friendly and enemy forces, weather, and geographical features required by a commander and his staff in the planning and conduct of combat operations. It is derived from the interpretation of information on the forces and the environment. The objective of combat intelligence is to minimize uncertainty concerning these factors on the accomplishment of the mission. The commander employs combat intelligence to determine how best to use available resources in accomplishing the mission and maintaining security of his command. The commander provides combat intelligence data to his subordinate elements to assist them in planning and carrying out their tasks. Combat intelligence is a continuous command function responsibility. To provide continued intelligence, the brigade S2 staff:

- 1)      Maintains a current intelligence estimate of the enemy's strengths and weaknesses, the terrain and the weather.
- 2)      Identifies brigade requirements for reconnaissance, surveillance, and target acquisition.
- 3)      Estimates the brigade's vulnerability to hostile intelligence.
- 4)      Supervises brigade security operations.

The organic assets provided for the brigade S2 staff are tactical radios, subordinate battalion reconnaissance operations, brigade

helicopters, and possibly a direct support element from the division CEWI battalion. The S2 staff tasks these assets to provide for the brigade I/EW needs. As needed, the S2 staff may request assistance from the division CEWI battalion. FM 71-2 explains:

"Specialists from the divisional military intelligence company may be attached to the battalion task force for counterintelligence operations and prisoner-of-war interrogation. A section from the divisional remote sensor platoon may also be attached to the battalion task force. These devices can provide information about enemy movement. The section chief can advise the battalion S2 on employment of REMS which can be emplaced by the section or by Army aircraft. Once emplaced, the REMS section monitors the devices and provides information to the battalion task force S2.

For aerial reconnaissance, the battalion task force S2 can request support through S2 channels from the corps military intelligence battalion, aerial reconnaissance support (MIBARS). The MIBARS has photographic, radar, and infrared capabilities."

#### A.1.1.1.3      Fire Support Command and Control

Fire support (FS) is the collective employment of mortars, field artillery, close air support (CAS), and naval gunfire (NGF) in support of a battle plan. These weapon systems are part of the total fire support system that provides long-range, responsive, flexible combat power. Figure A-1 depicts the fire support system.

The mission of the fire support system is to suppress, neutralize, or destroy surface targets with indirect fires and close support aircraft using guns, cannons, rockets, bombs, and missiles. The fire support

#### TARGET ACQUISITION

USAF FACs  
FISTS  
Radars  
Air CAV  
Remote Sensors  
Electronic and Signal Intelligence  
Sound and Flash Ranging  
NGF Spotter Teams

#### WEAPONS AND AMMUNITION

Mortars  
FA Cannons, Rockets, and Missiles  
CAS (OAS)  
NGF Weapons  
Attack Helicopters  
Selected ADA Weapons  
Tanks (Indirect Fire)

#### COMMAND, CONTROL, AND COORDINATION

Commander's Guidance Allocations and Priorities  
FSCOORD Duties and Facilities  
Fire Support Planning and Coordination

Figure A-1. Fire Support System

system provides close support for maneuver forces, counterfires, and other fires as required. These fires range from suppression of antitank guided missiles to suppressing enemy air defenses. They neutralize or destroy enemy attack formations or defenses or destroy targets deep in the enemy rear with long-range missile fires. Fire support can be conventional fires in a company zone or massive nuclear and chemical fires across a corps front.

To maintain close coordination and cooperation with the maneuver force, fire support coordinators (FSCORDS) organize and supervise a fire support coordination facility at every echelons from company to corps. This facility is colocated with the maneuver command post and puts technically qualified fire support personnel in continuous, personal contact with the maneuver operations personnel to ensure responsive fires on a minute-to-minute basis.

#### A.1.1.1.3.1      Field Artillery

The mission of the field artillery system is to destroy, neutralize, or suppress the enemy by cannon, rocket, and missile fire and to integrate all fire support into combined arms operations. The four elements of the field artillery system are:

- 1)      Target Acquisition
- 2)      Gunnery
- 3)      Weapons and Ammunition
- 4)      Command and Control

Command and control permits the effective employment of FA assets. C<sup>2</sup> includes:

- 1)      Tactics
- 2)      Organization
- 3)      Fire Support Planning and Organization

Command and control is established through:

- 1) Command Relationship
- 2) Assignment of Tactical Missions
- 3) Organization for Combat

When organized for combat, each FA unit is placed within a tactical organization and assigned a tactical mission. Table A-3 shows the inherent responsibilities of each mission.

A.1.1.3.1.1      Corps Control Units

The field support coordination for corps level is the corps field artillery officer. Based on the mission assigned to the corps, FA cannon and missile battalions will be assigned to the corps along with a number of FA brigade headquarters to provide command and control of these battalions. (See Figure A-2.) The corps commander, advised by the corps FSCOORD, assigns FA battalions to an FA brigade that has been tailored for a specific mission. The primary purpose of FA brigades is to augment division fires and reduce span of control based on how the corps commander intends to fight the divisions. The corps commander, advised by the corps FSCOORD, allocates his FA assets by attaching the FA brigades to the divisions or by assigning the FA brigades a tactical mission, normally reinforcing the fires of the division artillery.

Lance battalions and brigades are normally retained under corps control to attack targets that can affect the corps mission.

An FA unit assigned to the corps and not further attached to subordinate maneuver units is termed Corps Artillery. FA assigned to corps and all other units organic, assigned, or attached to subordinate maneuver elements of the corps are termed artillery with the corps and include FA of division, cavalry regiments, and separate maneuver brigades.

An FA unit with a mission of—	Direct Support (DS)	Reinforcing (R)	General Support-Reinforcing (GSR)	General Support (GS)
1. Answers calls for fire in priority from—	1. Supported unit 2. Own observers* 3. Force FA HQ	1. Reinforced FA 2. Own observers* 3. Force FA HQ	1. Force FA HQ 2. Reinforced unit 3. Own observers*	1. Force FA HQ 2. Own observers*
2. Has as its zone of fire—	Zone of action of supported unit	Zone of fire of reinforced FA unit	Zone of action of supported unit to include zone of fire of reinforced FA unit	Zone of action of supported unit
3. Furnishes fire support team FIST /FSO**	Provides temporary replacements for casualty losses as required	No requirement	No requirement	No requirement
4. Furnishes LO—	No requirement	LO to reinforced FA unit HQ	LO to reinforced FA unit HQ	No requirement
5. Establishes communications with—	FIST chiefs, FSO's and supported maneuver unit HQ	Reinforced FA unit HQ	Reinforced FA unit HQ	No requirement
6. Is positioned by—	DS FA unit commander or as ordered by force FA HQ	Reinforced FA unit or as ordered by force FA HQ	Force FA HQ or reinforced FA unit if approved by force FA HQ	Force FA HQ
7. Has its fires planned by—	Develops own fire plans	Reinforced FA unit HQ	Force FA HQ	Force FA HQ

\*Includes all target acquisition means not deployed with supported unit (radar, AO, survey parties, etc.)

\*\*An FS section (FSO team) for each maneuver brigade/battalion/caavalry squadron and one FIST with each maneuver company/ground cavalry troop are trained and deployed by the FA unit authorized these assets by TOE. After deployment, FIST and FSO teams remain with the supported maneuver unit throughout the conflict.

Table A-3. Inherent Responsibilities of FA Tactical Missions (FM 6-20)

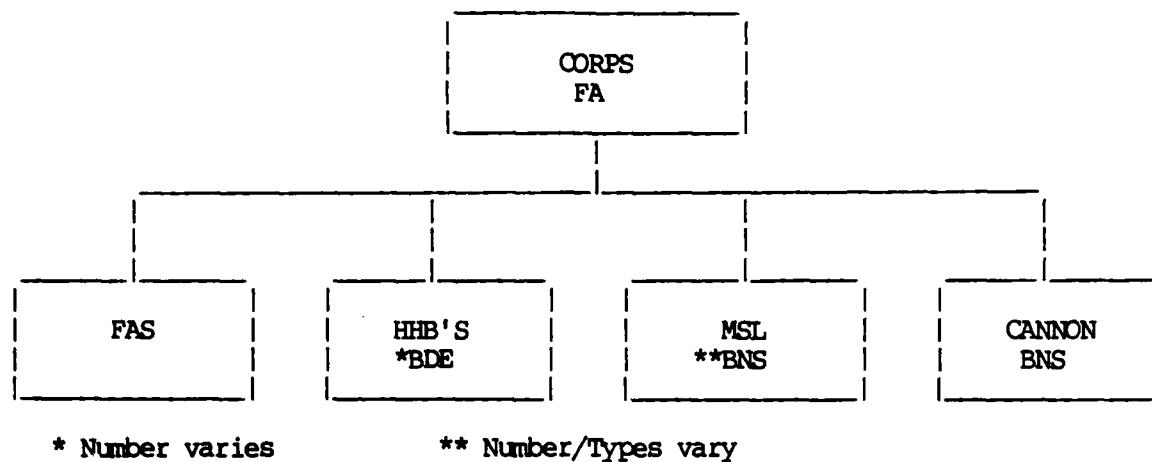


Figure A-2. Corps Artillery

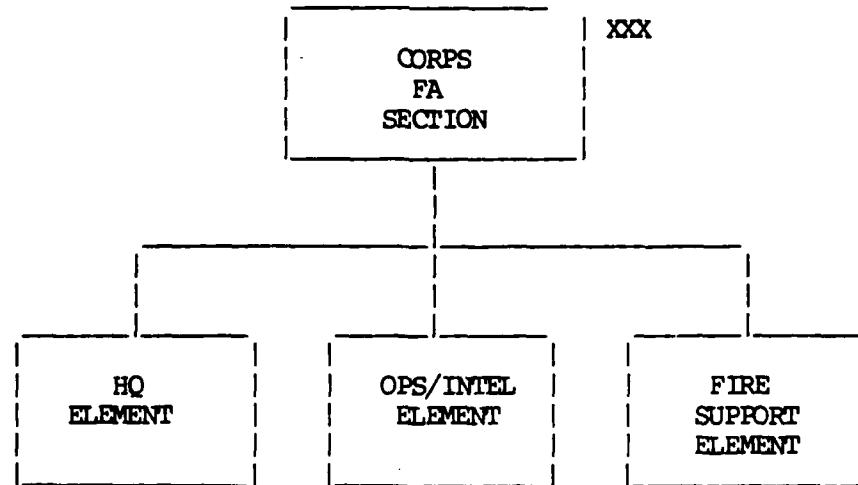


Figure A-3. Corps FA Section

A.1.1.1.3.1.1.1 Corps Field Artillery Section (FAS)

The corps FA section organic to the corps headquarters and headquarters company is organized as shown in Figure A-3.

The operations intelligence element exercises control of corps field artillery units and the fire support element functions in the corps tactical operations center (CTOC) to plan and coordinate all fire support for the corps. The corps FSCOORD functions in two capacities. In the operations element, he functions as the commander of corps artillery and in the FSE, he is the corps FSCOORD. In these two capacities, his major fire support duties are:

- 1) Serving as the principal corps adviser on all fire support matters.
- 2) Providing guidance for and supervising the planning and coordination of all fire support assets available to the corps.
- 3) Recommending organization of corps artillery for combat.
- 4) Operating the fire support element in the corps TOC.
- 5) Recommending fire support means to attack surface targets.
- 6) Recommending locations for FA ammunition supply points/special ammunition supply points (ASP/SASP) and supply rates for FA ammunition.

- 7) Recommending fire support coordinating measures to be used.
- 8) Advising on hostile fire support capabilities.
- 9) Coordinating general position areas and fire planning for FA retained at corps level.
- 10) Coordinating movements of elements in corps artillery.
- 11) Developing nuclear weapons packages in coordination with the divisions.
- 12) Providing training management for fire support training throughout corps.

#### A.1.1.3.1.1.1 Command and Control

According to the FAROs:

"The range of decisions which are made at the FAS [FSCOORD] and transmitted to the artillery units and Navy and Air Force representatives as appropriate include the following:

- o Determination of the field artillery organization for combat (transmitted through intermediate headquarters to the field artillery batteries).
- o Amplification of the corps commander's planning guidance and restrictions (transmitted to the Navy and AF representatives and through the intermediate headquarters to the FA units).

- o Assignment of priority of fires (transmitted to the AF and Navy representatives and through the intermediate headquarters to the FA batteries).
- o Assignment of targets to fire support assets (transmitted through the intermediate headquarters to the FA batteries or to Navy or Air Force representatives).
- o Development of the corps fire support plan (including the field artillery support plans) (transmitted to the FA units and Navy and Air Force representatives).
- o Coordination of FA unit movement (transmitted to the FA unit concerned)

In reaching the above decisions, the FAS considers the following:

- o The mission planning guidance received from Corps.
- o The availability of nuclear and chemical weapons (received from FA units, Navy and Air Force representatives) and release authority (received from corps).
- o The status of units which it receives through intermediate headquarters from the GS batteries.
- o The availability of other fire support means which it receives from Air Force and Navy representatives in the FSE.

- o Target intelligence which it receives from the corps fusion center and the corps G2 and G3 sections or over a direct QUICKFIRE channel with a target sensor.
- o Requests for fire support (received from the division FSE).
- o The plan of maneuver and current operations orders which it receives from corps.

The FAS personnel provide feedback to the corps headquarters (TOC) by means of the corps fire support plan, situation reports reflecting significant incidents and combat effectiveness (and NBC reports [STANAG])."

#### A.1.1.1.3.1.1.2 Field Artillery Brigades and Battalions Under Corps Control

Brigades are tailored by the corps commander for a specific mission and may have up to six FA battalions attached. The FA brigades provide flexibility to the corps commander in organizing for combat and extending his span of control.

Figure A-4 depicts a type cannon FA brigade that has been tailored to provide mobility and representative calibers for the support of a division covering force.

#### A.1.1.1.3.1.2 Division Control Units

At division level, the division artillery is the tactical headquarters that commands and controls the organic FA and attached units. Unlike the corps artillery or FA brigades, the division artillery of each type division has its own organic FA battalions as shown in Figure A-5 through Figure A-8.

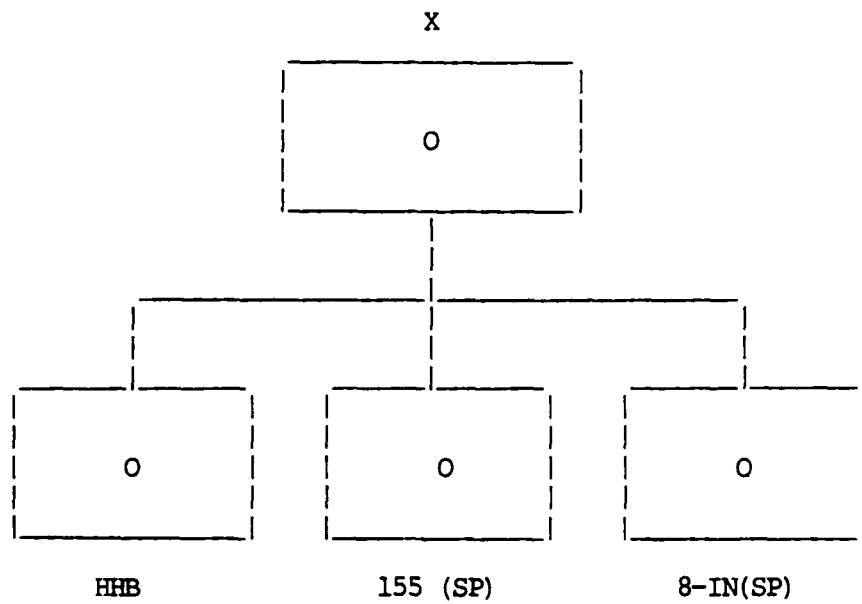


Figure A-4. Type FA Brigade (Example)

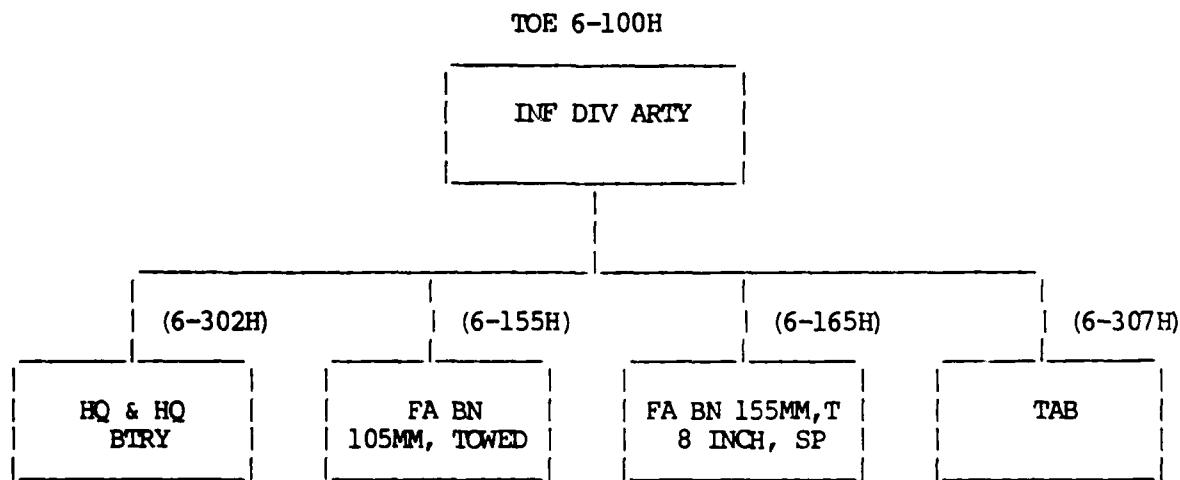


Figure A-5. Field Artillery Organic to Infantry Divisions

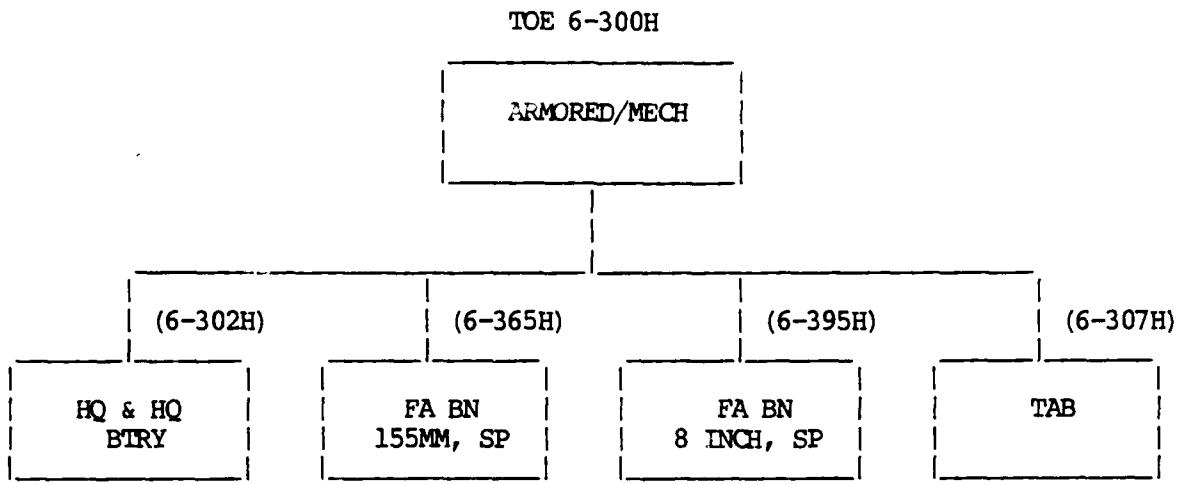


Figure A-6. Field Artillery Organic to Armored and Mechanized Divisions

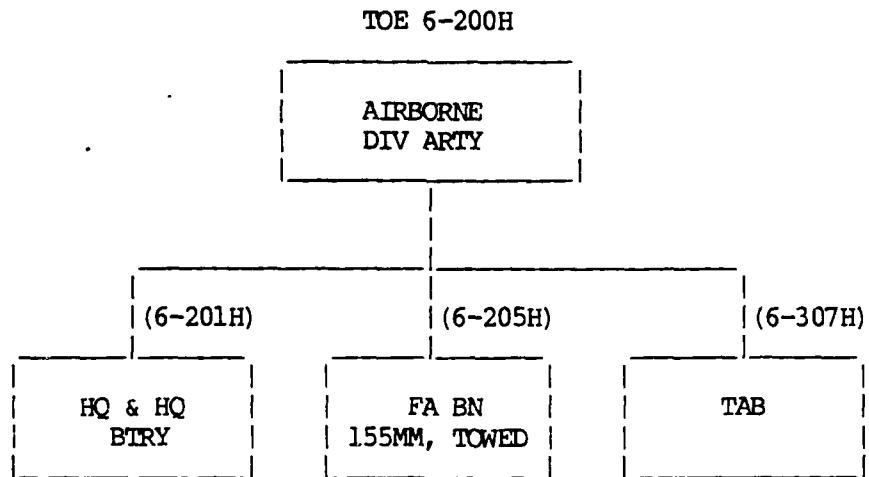


Figure A-7. Field Artillery Organic to Airborne Divisions

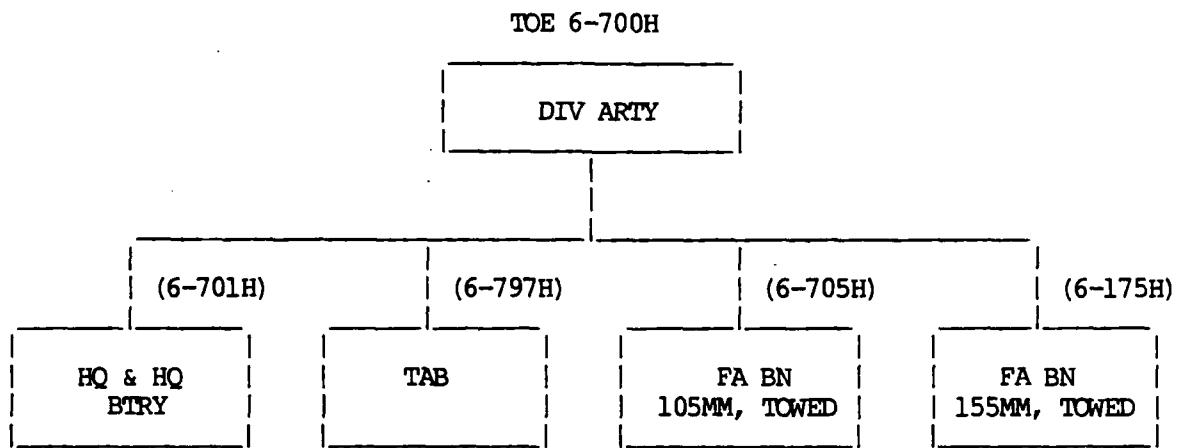


Figure A-8. Field Artillery Organic to Airmobile Divisions

The division artillery commander is responsible for all FA support for the division. This is accomplished by the assignment of tactical missions to the FA battalions organic to or attached to division artillery and the effective use of augmenting FA fires by corps artillery.

A.1.1.1.3.1.2.1 Division Fire Support Element

There are two types of fire support elements, MAIN and TAC.

The MAIN FSE is concerned with formal fire planning and is located at the division Main CP.

The TAC FSE is concerned with immediate or near-immediate fires and is located at the TAC CP. Table A-4 shows the personnel assigned to an FSE by types of division. FSEs are normally delegated authority to override fire support requests of subordinate fire support facilities.

The FSCOORD at the FSE has the following range of decisions regarding fire support:

- 1) Amplification of the division mission planning guidance (transmitted to Air Force and Navy representatives and to divarty).
- 2) Determination of the organization of fire support means for combat (transmitted to the divarty TOC and AF and Navy representatives).
- 3) Assignment of priority of fires (transmitted to divarty TOC, AF and Navy representatives).
- 4) Assignment of targets to fire support means (transmitted to the divarty TOC, AF or Navy representatives).

RESOURCE	RANK	TYPES OF DIVISION		
		ARMD MECH INF	ABN	AASLT
<b>PERSONNEL</b>				
SR AFSCOORD	O5	1	1	1
AFSCOORD	O4	1	1	1
FA INTEL OFF	O4	1		1
TGT ANALYST	O3	2		
AFSCOORD	O3		2	
INTEL SGT	E8	1	1	1
OP SGT	E8	1	1	1
*FS SGT	E7	1	1	1
**FS SGT	E6	1	1	1
RATT OP TM CH	E5	1		
CLK TYPIST	E4	1	1	1
*FS SPECIALIST	E4	2	1	1
INTEL SP	E4		1	
RATT OP	E4	1		
RADIO OP	E4			1
RATT OP	E3	1		
<b>TOTAL</b>		15	11	10

\* Converted from MOS 13 E to 13F

\*\* FSE authorized personnel must operate both tactical and main FSEs concurrently.

Table A-4 FSE Personnel

- 5) Composition of fire support plans with field artillery and nuclear and chemical support plans (transmitted to divarty TOC, AF and Navy representatives).
- 6) Generation of requests for additional fire support (requested from the corps FAS).

The FSE commander and staff consider the following items when making the above decisions:

- 1) Mission planning guidance and restrictions from division.
- 2) The availability of nuclear and chemical weapons (which it receives from divarty, AF and Navy representatives) and release authority (received from division).
- 3) The status of FA units which it receives from situation reports received from the divarty TOC.
- 4) The availability of other fire support means which it receives from Navy, Air Force, and other fire support representatives at the FSE.
- 5) Target intelligence and information which it receives from the division fusion center, the division G2/G3, and brigade FSE or directly from a target sensor over QUICKFIRE channels.
- 6) Current plans and operations orders (received from division).

- 7) Requests for additional fire support (received from brigade FSE).

The FSE staff provides information to the corps FSE and division TOC by means of plans, situation reports reflecting significant enemy action (and STANAG reports).

A.1.1.1.3.1.2.2 Divarty Tactical Operation Center (TOC)

The divarty commander has the range of decisions listed below regarding field artillery fire support. These decisions are developed with support of the divarty staff and are directed to general support (GS) units maintained under division control and to the target acquisition battery (TAB).

- 1) Assignment of targets to assets (transmitted to firing unit concerned).
- 2) Composition of the division field artillery support plan (including the target acquisition annex) (transmitted through battalions to batteries).
- 3) Development of positioning guidance for GS bn and TAB.
- 4) Assignment of zones and priorities of observation to TAB.

The divarty commander and staff consider the following items in reaching the above decisions:

- 1) Mission planning guidance and restrictions (received from the FSE).

- 2) The availability of nuclear and chemical weapons (received from FA units) and release authority (received from division).
- 3) The status of units (from situation reports received from GS units and the TAB).
- 4) Target intelligence from the division FSE, TAB assets, air observers, and as developed by the staff (targeting element).
- 5) Current plans and operations orders (from the FSE).

The divarty staff reports its plans and actions to the division by means of the field artillery fire support plan, divarty situation reports reflecting significant enemy action and combat effectiveness, and STANAG reports. The divarty personnel also informs the SHORAD battalion TOC of status, plans, and activities.

#### A.1.1.1.3.1.2.3 Battalions

The battalion Fire Detection Center (FDC) personnel conduct both technical and tactical fire direction and the assignment of units to fire and fire control. The fire support section of the direct support FA field artillery battalion establishes a fire support element (FSE) to provide fire support planning and coordination at the maneuver battalion/task force level.

- 1) The organization and equipment for the various types of sections are shown in Figure A-9.
- 2) The Fire Support Officer (FSO) at battalion/task force level is the FSCOORD and supervises the FISTS supporting the unit. He is the battalion/task force

## PERSONNEL

## **EQUIPMENT**

E	7			A	N / P R C 7 7
S	r			A	N / G R A 3 9
F	ire			A	N / V R C 4 9
C	P	T		A	N / V R C 4 7
F	S	O		A	N / G R C 1 6 0
M	1	5	1	M	5
E	4	Fire	S pt	M	6
				M	7
			w / tir		

**Inf Bn**                    1    1    2    1                    1    1    2    1    1

Inf Bn (Abn) \* 1 1 2 1 2 1 2 1

Inf Bn (AASLT) 1 1 2 1 1 2 1 1

\* Personnel must be parachutists.

Figure A-9. Fire Support Section, Battalion Level

commander's principal adviser on fire support matters. He recommends allocation of fire support, prepares fire support plans, assigns target numbers, and eliminates duplicate targets. He monitors requests for fire support and coordinates requests for fire units and fire support requirements to the maneuver and fire support commanders, ensures maximum effectiveness of available fire support, and supervises the operation of the FSE.

A.1.1.3.1.3      Brigade Control Units

- 1) FS sections for the various maneuver brigades are shown in Figure A-10.
- 2) The DS FA battalion commander is the brigade FSCOORD. His full-time representative, the brigade FSO, remains at the brigade CP. There he supervises the battalion FSOs and he accomplishes the same advisory, planning, and coordinating tasks as those described for the FSE at battalion level.

A.1.1.3.1.3.1    Brigade Fire Support Element (FSE)

The fire support element in the brigade CP is operated by the fire support officer from the DS SA battalion. The brigade FSE is involved in the planning and coordination of all fire support for the brigade.

The brigade FSE FSCOORD has the following range of decisions with regard to fire support for the brigade:

- 1) Assignment of targets to fire support assets.
- 2) Assignment of priority of fires.

## PERSONNEL

## EQUIPMENT

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S												
S												
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P												
r												
Mvr Bde												
Mech Div	1	1	2	1	1							
Armd Div												
Mvr Bde	1	1	2	1								
Abn Div												
Mvr Bde *	1	1	2			1	2	1				
Abn Div												
Mvr Bde	1	1	2	1					1	2	1	1
AASLT Div												

\* Personnel must be parachutists.

Figure A-10. FS Section for Maneuver Brigades

- 3) Generation of requests to the division FSE for additional fire support.

The brigade FSE commander and staff considers the following items in reaching the above decisions:

- 1) Mission planning guidance and restrictions from brigade.
- 2) The availability of nuclear and chemical weapons (from FA units NGF and AF) and release authority (from division FSE).
- 3) Unit status (from firing unit situation reports).
- 4) Availability of other fire support means (from NGF and Air Force representatives).
- 5) Target intelligence (from artillery observers, TAB, and Division TOC).
- 6) Plan of maneuver and current operations orders (from brigade).

The brigade FSE personnel report its fire support activities and situation to the division through fire support plans, situation reports reflecting significant enemy activity, combat effectiveness and STANAG reports.

A.1.1.1.3.1.3.2    Direct Support Battalion Headquarters

A.1.1.1.3.2        Air Power Control Units

Close air support is defined as air attacks against hostile targets that are in close proximity to friendly forces and require detailed integration of each air mission with the fire and movement of those forces. This is one element of the offensive air support which also includes tactical air reconnaissance and battlefield interdiction.

A.1.1.1.3.2.1      Army Air-Ground System

The Army air-ground system provides the ground force commander with the organization and means to process, evaluate, and coordinate requests for air support and tactical air reconnaissance, and for continuous exchange of combat information and intelligence with the Air Force commander. The Army air-ground system extends through all Army echelons down to maneuver battalion. Through this system, the ground force commander integrates surface fires with the fires of supporting tactical aircraft and coordinates the reconnaissance and surveillance efforts of Army aviation with supporting tactical Air Force elements. The system is operated by staff personnel who have received specific training in air-ground operations. The G3 (S3) is responsible for general staff supervision of all air-ground operations except administrative airlift and reconnaissance and surveillance. Administrative airlift is the responsibility of the G4 (S4). Air reconnaissance and surveillance is the responsibility of the G2 (S2).

The FSCOORD at each echelon is responsible to review all requests for fire support from subordinate units; evaluate CAS requests in light of other requirements; and make decisions within delegated authority to furnish requested support, substitute other types of support, or disapprove the request. When considering CAS requests, as one portion of total fire support, the FSCOORD works closely with the S3/G3 air and air liaison officer at each level. In this capacity he has the following responsibilities:

- 1) Provides planning information on CAS to the assistant G3 for CAS for development of allocation recommendations.
- 2) Reviews allocation of CAS resources and recommends suballocation.
- 3) Monitors execution of all fire support missions to determine adequacy of mission accomplishment and coordinates post-strike damage assessment with TACP and the G2.
- 4) Coordinates with the airspace management element, the tactical air control party, and the assistant G3 for CAS on fire support requirements for use of airspace and keeps all elements informed on status of planned special ammunition fires.
- 5) Recommends targets for attack by air-delivered special ammunition fires and recommends air interdiction targets.

#### A.1.1.1.3.2.1.1 Corps Preplanned Missions

The corps G3 air evaluates the division requests; coordinates with the FSCOORD, the ALO at the division air support center and the corps air defense personnel; assigns priorities to approved requests; and forwards them to the Army liaison element at the Air Force tactical air control center. The Army liaison element consolidates the theaterwide requests and passes them as Army requirements to the TACC.

#### A.1.1.1.3.2.1.2 Division Preplanned Missions

At division main, requests are processed in essentially the same manner as at brigade and battalion. Consolidated requests are coordinated by an assistant G3 for CAS with the division FSCOORD, ALO, and division air defense personnel. They are then forwarded to corps G3 air.

#### A.1.1.1.3.2.1.3 Brigade Preplanned Missions

The brigade S3 air coordinates the requests with the FSO and ALO and integrates the requests with those of the other maneuver battalions. He eliminates duplications, assigns priorities, and forwards the requests to the assistant G3 for CAS operations at the division main CP.

#### A.1.1.1.3.3 Naval Gunfire Control Units

Naval gunfire can provide large volumes of immediately available responsive fire support to combat forces operating in close proximity to coastal waters.

#### A.1.1.1.3.3.1 Air/Naval Gunfire Liaison Company

The air and naval gunfire liaison company (ANGLICO), Fleet Marine Force, is a unit specifically designed for support of U.S. Army or allied divisions. It provides control and liaison agencies associated with the ground elements of a maneuver force in the control and employment of naval gunfire and Navy/Marine close air support. It does not provide tactical air direction centers or direct air support centers and it is designed to operate only at division level and below. The mission of the ANGLICO includes the provision of support to airborne units by parachute-qualified personnel. Task-organized control and liaison teams and parties are further assigned to division, brigade, and battalion echelons to advise on the capabilities, limitations, and employment of naval gunfire and/or naval air support and to provide the necessary personnel and communications required at the various

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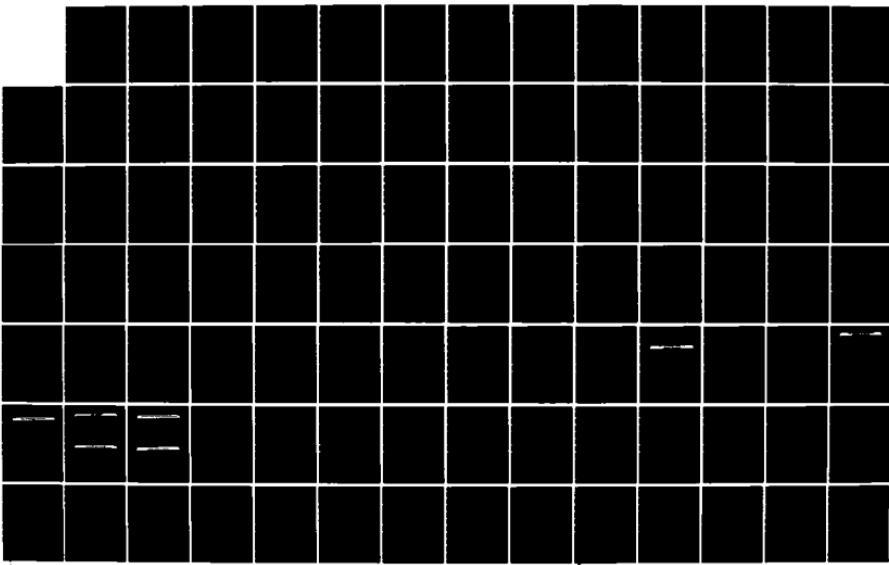
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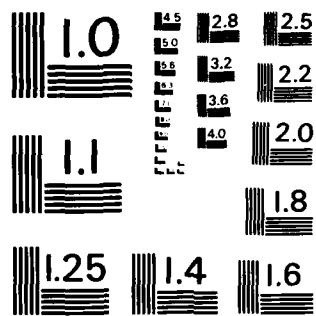
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echelons to request, direct, and control the support. Figure A-11 shows the organization of ANGLICO.

A.1.1.1.3.3.2      Division Level

At the division level the ANGLICO will provide a Marine lieutenant colonel who will function as the NGF liaison officer in the division fire support element. His main functions are to advise the commander and his staff and to coordinate the employment of NGF support.

A.1.1.1.3.3.3      Brigade Level

A naval gunfire liaison officer is also provided to each of the brigade headquarters. This officer will be placed in the fire support element and will advise the commander and his staff on naval gunfire and will coordinate its employment in support of brigade operations.

A.1.1.1.3.3.4      Battalion Level

At the maneuver battalion level is a shore fire control party (SFCP) which consists of a naval gunfire liaison team and a naval gunfire spot team. The liaison team will be located in the battalion fire support element and the naval gunfire spot team will normally be located with one of the companies. The spotter's primary function is to request and adjust naval gunfire similar to the manner in which the forward observer adjusts artillery. The liaison officer's duties are essentially the same as those already discussed for the NGF officer at the division and brigade levels.

A.1.1.1.4      Combat Service Support (CSS) Command and Control

This section describes the units and elements that participate in CSS Command and Control decisions by echelon from corps to battalion. CSS broadly subdivides into Logistics (general support supply,

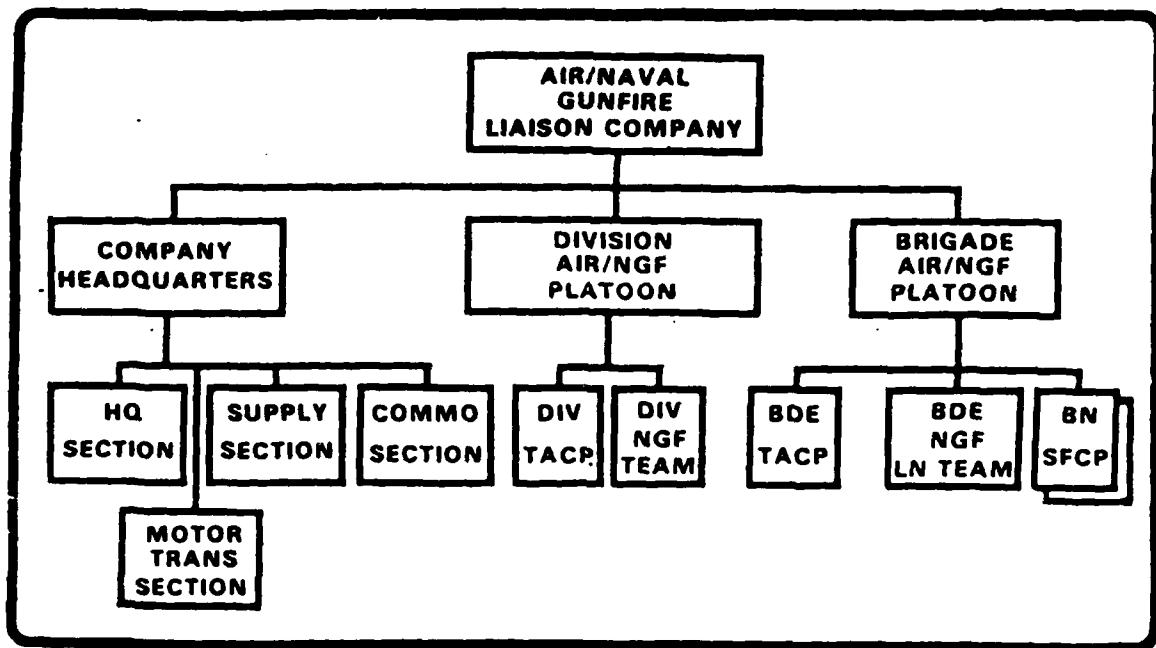


Figure A-11. Organization of ANGLICO  
(FM 60-2)

maintenance, transportation and field services) and personnel service support (personnel replacement and medical services).

A.1.1.1.4.1      Corps Control Unit

Each control unit will be described in terms of its decisions, factors used in making these decisions, information feedback to higher echelon units, and its assets, both equipment and human resources. All CSS control units possess a capability for planning and situation assessment. CSS is controlled by Support Commands at the Corps and Division level. These commands are described below. CSS maintains a liaison section at the Tactical Command Post at the corps and division level.

A.1.1.1.4.1.1      Corps Support Command (COSCOM) Headquarters

According to FM 100-10 (Command Service Support),

"At corps level, the COSCOM provides general support supply, maintenance, transportation, field services, personnel, and medical support to all elements of the corps plus direct support to nondivisional corps units. The organizational structure of the COSCOM is flexible, depending on mission requirements.

The COSCOM commander uses a material management center for management of supply and maintenance throughout the corps in accordance with priorities established by the corps commander. The COSCOM Materiel Management Center (MMC) continuously monitors the operability of weapon systems (using ADP produced output) and takes action to keep them operational. Supply requisitions from Direct Support (DS) units and divisions are filled from COSCOM assets. If none are available, resupply requisitions, except for items supplied by air, are forwarded through the COSCOM MMC to the

theater Army MMC to meet the needs of the corps. Air lines of communication items are requisitioned directly from CONUS by the COSCOM. The corps Movement Control Center (MCC), in close coordination with the MCC, provides movement management services within the corps area."

COSCOM assets include its staff, the Automated Data Processing Center (ADPC), communications lines, and its signal center and personnel with multi-channel and tactical radios as well as RATT and wire capabilities.

Command and Control - The COSCOM Headquarters staff are responsible for developing plans and policies for combat service support to corps units, and recommending priorities of support and allocation to corps headquarters and DISCOM. Both these activities involve coordination with corps and Division Support Command (DISCOM) commanders.

In particular, the COSCOM Headquarters coordinates reconstitution and Rear Area Combat Operations (RACO) efforts with the Corps Rear CP. In making these decisions, COSCOM headquarters staff consider supply, maintenance and transportation information from the MMC and MCC, as well as action unit operational status reports and requests for further evacuation from the Medical Group/Brigade. Information feedback takes the form of reports to the Corps Tactical Operations Center on CSS unit activities for its use in planning support priorities and allocations.

#### A.1.1.1.4.1.2      Materiel Management Center (MMC)

The MMC chief makes decisions in two main areas:

1. It directs the storage and distribution of supplies, coordinating with the MCC for supply transport. This includes ordering issue of Class VII items from available stocks or sending a requisition to CONUS

wholesale level, upon receipt of requisition from supported units, and directing POL battalions to release supplies to POL supply companies.

2. It provides tasking to supported maintenance units.

In making the above decisions, the MMC chief considers requests from using units for Class VII items; direction from corps headquarters to release controlled Class VII supplies; direction and policies from COSCOM Headquarters including the Controlled Supply Rate for ammunition; requests from the DMMC for additional POL and POL requirement forecasts from POL supply companies; ammunition allocations from COSCOM Headquarters, based on the decision of the corps commander; maintenance and materiel status reports from maintenance battalions, and requests for backup aviation maintenance for the division, through the DMMC. Information feedback consists of reports to the COSCOM Headquarters on maintenance activities and supply levels. Assets include the ADPC and its staff.

Under the control of the MMC are the following organizations: Support Group Headquarters and Ammunition Group Headquarters.

A.1.1.1.4.1.3      Support Group Headquarters

The DS and GS Maintenance Battalions, the Supply and Service Battalion, and the Transportation Aviation Maintenance (TAM) Battalion belong to one of several support groups. The Support Group Headquarters serves as an intermediate command and control headquarters between these units and the MMC; therefore, it is sufficient to represent the Support Group Headquarters as a control asset of the MMC.

A.1.1.1.4.1.4      Ammunition Group Headquarters

The Ammunition Group Headquarters serves as an intermediate command and control headquarters between the Ammunition Battalion and Missile

Support Battalion and the MMC. The supply of ammunition is affected by ammunition allocations from the corps commander and Controlled Supply Rate from subordinate tactical commanders.

A.1.1.4.1.5      Movement Control Center (MCC)

The MCC's decisions are to coordinate the movement of personnel, materiel and backup aviation maintenance for the division with the MMC, and to assign movement tasks to the Transportation Group. In making these decisions the MCC considers unit status reports from corps action units.

Information feedback from the MCC includes reports on transportation activities to COSCOM Headquarters. Assets include staff and communication links.

A.1.1.4.1.6      Transportation Composite Group/Brigade Headquarters

Although the Transportation Composite Group/Brigade Headquarters is a separate unit from the MCC, it chiefly serves as an intermediate command and control headquarters between the MCC and the Motor Transport and Aviation Battalions.

A.1.1.4.1.7      Medical Group Headquarters

The decisions made by the commander of this unit are in tasking the ambulance companies to perform medical evacuation in the corps and division areas. The Medical Group Headquarters receives requests from supported units in the corps area through the COSCOM Headquarters, or from the division Medical Battalion for medical evacuation of patients to corps medical facilities.

Information feedback includes reports to COSCOM Headquarters on the operational status of medical units and requests for further evacuation to Communication Zone hospitals.

A.1.1.1.4.2      Division Control Units

A.1.1.1.4.2.1      Division Support Command (DISCOM) Headquarters

The DISCOM is organized to provide division-level combat service support (except communications security maintenance, construction, legal services, and public affairs) to all elements of the division. The DISCOM commander commands and controls the units that form the DISCOM.

The DISCOM commander commands and controls division combat service support units. In addition, he coordinates with the division staff. Each division staff officer has the responsibility for planning in his respective area. The DISCOM commander is the principal CSS operator of the division and executes a large part of the division support plan. The DISCOM commander is responsible for providing advice to the division staff during the formulation of division-level tactical and CSS plans, policies, and priorities.

At division level, the DISCOM commander uses the division materiel management center (DMMC) as his primary logistics coordinating and managing element.

DISCOM commander assets include the Division Data Center (DDC) and the Forward Area Support Coordinating Officer (FASCO). Its communications assets are the DDC, communications links and a signal center with multi-channel and tactical radios, RATT and wire capability.

The DISCOM Headquarters makes such decisions as allocation of POL transportation assets (done by the Movement Control Officer in coordination with the DMMC); and the organization of DISCOM unit movement, in coordination with the division G-4. The DISCOM Headquarters staff also coordinates reconstitution and RACO efforts with the Division Rear CP. Considerations used in making these decisions include policy guidance on

transportation movement from the Division Transportation Officer at Division Headquarters, information on the logistics situation in the brigade area from the FASCO (the FASCO coordinates with the brigade headquarters) and information from the Division G-3 and G-4 on the division's tactical plan. Information feedback from the DISCOM Headquarters includes advice to the division commander and G-4 (DTOC) on logistics, advice to the division commander on airdrop operations in airmobile and airborne divisions, and coordination with COSCOM Headquarters.

#### A.1.1.1.4.2.2 Division Materiel Management Center (DMMC)

The DMMC staff continually examines weapon systems readiness and takes management action to keep the weapon systems operational. They monitor compliance with the maintenance priorities established by the division commander and take immediate action to obtain critical repair parts when necessary to return a weapon system to combat. The DMMC also coordinates and controls supply operations to move supplies forward and shift support resources to meet operational needs. When division requirements cannot be met by division resources, the DMMC staff request supplies or assistance from the COSCOM, usually through the COSCOM MMC.

Decisions made by the DMMC chief are to develop authorized stockage list (ASL), and prescribed load lists (PLL) for supplies; procure and direct distribution of division supplies; authenticate ammunition requests of user units, based on replacement of the basic load and the controlled supply rate from tactical unit commanders; to plan the operation and location of supply distribution points; and to coordinate with the Movement Control Officer at DISCOM Headquarters on POL distribution and personnel transport.

Considerations used in making these decisions include ammunition request from using units, POL needs from using the unit's G-4 and Brigade S4, POL status reports from Class III distribution points, the Controlled Supply Rate from tactical commanders, and requests for backup

aviation maintenance from division aviation maintenance companies. Information feedback includes requests for additional POL through the corps MMC.

Assets of this unit include the Division Logistics System (DLOGS), the Maintenance Reporting and Management System from the Division Data Center, and computer terminals.

A.1.1.1.4.2.3      Supply and Transportation BN Headquarters and Maintenance BN Headquarters

Although the Supply and Transportation Battalion Headquarters (or the Supply and Service Battalion Headquarters of the Airmobile and Airborne DISCOM'S) and the Maintenance Battalion Headquarters are separate units from the DMMC, they chiefly serve as intermediate command and control headquarters between the DMMC and the Transportation Motor Transport Company, Supply and Service Company, and the Maintenance Companies; therefore it is sufficient to represent these units as command and control assets of the DMMC.

A.1.1.1.4.2.4      Medical Battalion

The decisions for which the Medical Battalion commander has responsibility include determining which patients should be reported to the Medical Group as needing evacuation to corps hospitals, and tasking the support company and the forward companies. The battalion receives status reports and evacuation requests from the support company and the forward companies. Information feedback from the Medical BN consists of reports of operational status of its units and requests for further evacuation of patients, both of which are sent to the Medical Group at corps. Its assets include communication links.

#### A.1.1.1.4.3

#### Brigade Control Units

There is no distinct organic support command at the brigade level; brigade units are serviced by units of DISCOM and in some cases COSCOM (e.g., unit distribution of POL). Liaison between DISCOM elements and the brigade is supplied by the FASCO, which is organic to the DISCOM Headquarters. The FASCO directs the operations of all DISCOM Forward Support elements located with the brigade they support. Therefore, there are no distinct combat service support command and control elements at this level.

A group of personnel, vehicles, and equipment operating together to provide combat service support is called a train. Brigade trains consist of the Brigade S4 section and any organic support units plus selected units of the COSCOM and DISCOM. Brigade trains are frequently employed to provide logistic support to brigade units.

In the divisions organized under Army 86 concepts, the DISCOM will provide a forward support battalion for each brigade. Each forward support battalion, although part of the DISCOM, will be placed in direct support of the brigade and provide priority of effort to the support required by that brigade. The support battalion will plan, coordinate, and supervise the CSS provided to the brigade and other divisional units located in the brigade support area. The battalion commander will report directly to the DISCOM commander.

#### A.1.1.1.4.4.

#### Battalion Control Units

There are no distinct CSS control units at the battalion level. Usually, the CSS functions of the battalion are performed by personnel assigned to such CSS functions as supply, maintenance, medical, communications-electronics (C-E), personnel, and administration. The CSS capability within these functional areas may vary with the type of battalion.

Air defense artillery can deny or limit enemy aerial reconnaissance, engage and destroy or drive off offensive enemy aircraft, deny enemy aircraft airspace over portions of the battlefield and provide artillery support for friendly aircraft.

ADA units are under the operational control of the theater ADA commander. Tactical missions can be assigned to ADA units to support maneuver forces. An ADA unit assigned a mission of direct support plans its air defense based primarily on the priorities of the supported unit; whereas, an ADA unit assigned a mission of general support plans its air defense based on the priorities established by the force commander. The different types missions are:

1) GENERAL SUPPORT (GS)

An ADA unit with GS mission provides AD for the force as a whole. The unit remains under the control of the force ADA commander and provides the force commander the means to respond to changes in either the scheme of maneuver or the air threat.

2) GENERAL SUPPORT-REINFORCING (GSR)

An ADA unit given the mission of general support-reinforcing furnishes ADA support to the force as a whole. This support takes precedence over support for the reinforced unit.

3) REINFORCING (R)

An ADA unit assigned the mission of reinforcing augments the fires of another ADA unit. The reinforcing unit remains under the command of the commander assigning the reinforcing mission, but

control of unit movement as necessary to accomplish assigned tasks or missions passes to the reinforced unit.

4) DIRECT SUPPORT (DS)

ADA with a DS mission provides close and continuous ADA support to a designated maneuver unit and coordinates its movement and fires with the element it supports. The DS ADA commander positions his unit as necessary to properly support the operations of the supported element. When possible, the same ADA unit is habitually placed in DS of the same maneuver element in order to assist in combined arms teamwork. An ADA unit with a mission of DS remains under the command of the ADA commander assigning the DS mission. The DS mission is appropriate for a battery or battalion.

5) MODIFIED TACTICAL MISSIONS

When the intent of the commander cannot be accurately conveyed by the use of standard tactical missions, a particular mission may be modified to meet a tactical need.

A.1.1.1.5.1           Corps Control Units

A.1.1.1.5.1.1       ADA Group Operations Center

Because ADA forces are allocated to the corps based on an operational need, there is a requirement for the corps to have assigned an ADA element on the staff. This element provides a planning/advisory service to the corps commander/G3. It recommends how ADA units should be employed and what corps critical assets should be defended, and performs airspace management duties in the corps tactical operations center (CTOC). When an ADA

group is placed in support of the corps, the ADA group commander then becomes the principal advisor to the corps commander on ADA matters. The group commander may use the ADA element chief as his representative in the corps tactical operation center.

In exercising its command and control capability, the group commander makes the following range of decisions:

- 1) Imposition of more restrictive weapons control status
- 2) Assignment of missions to the GSR and GS HIMAD battalions, and the SHORAD battalion at corps
- 3) Assignment of sectors of fire and PTL for the GS HIMAD battalion

In making these decisions, the GOC considers the following information:

- 1) Defense Readiness Conditions (DEFCON's) from the airspace coordination center at the Air Force theater level. These are states of readiness to be assumed by all forces within a theater in order to provide a progressive buildup of forces before the outbreak of hostilities; plans of subordinate headquarters contain requirements for actions to be taken corresponding to each DEFCON.
- 2) Air defense warning from the airspace coordination center at the Air Force theater level. An air defense warning includes the probability and probable time of an attack:

Red - attack imminent or in progress  
Yellow - attack probable  
White - attack not probable at this time

- 3) Weapons control status from the airspace coordination center at the Air Force theater level. Weapons control status may be weapons free (fire at any aircraft not identified as friendly), weapons tight (fire at only those aircraft identified as hostile according to current hostile criteria), and weapons hold (fire only in self-defense).
- 4) Friendly aircraft information and maneuver unit plans from the Corps TOC.
- 5) Reports on unit operational status and progress of the air battle from the GS and GSR HIMAD BOC and the SHORAD BN TOC at corps.
- 6) Early warning from the Air Force CRC
- 7) Target information from the Missile Minder computer system (from the Air Force's Control and Reporting Center (CRC)).

Information feedback consists of unit status reports from the GOC to the CTOC.

A.1.1.1.5.1.2      GS HIMAD BOC (Battalion Operations Center)

The longer range weapons provide weapon support for the entire corps area. They provide a capability for AD coverage or surface fires beyond the FEBA.

The GS HIMAD BOC commander and staff are involved in the following range decisions:

- 1) Tasking of HIMAD firing units (through the battery headquarters)
- 2) Planning and ordering the movement of the GS HIMAD battery and firing units
- 3) Assignment of targets to the firing units (through the battery headquarters)
- 4) Planning HIMAD defenses in support of SHORAD air defense plans

In making these decisions the GS HIMAD BOC considers the following information:

- 1) Its mission, fire control orders, and air defense information received from the GOC
- 2) Unit and equipment status reports and air battle results received from the GS HIMAD batteries
- 3) Target information from the Missile Minder computer system
- 4) Information on the ground and air situation provided by its intelligence section

Information feedback includes reports on unit operational status and progress of the air battle, sent to the GOC.

A.1.1.1.5.1.3

SHORAD BN TOC (Tactical Operations Center)

Short range AD weapons are used primarily to support the maneuver force. The commanders rely on radio communication and standard operating procedure for command and control of subordinate units. The decisions made by the SHORAD BN TOC commander are planning and ordering movements for its batteries and firing units and establishing sectors of fire and PIL for SHORAD weapons.

In arriving at these decisions, the SHORAD BN TOC command and staff consider the following information:

- 1) Information on enemy and friendly aircraft supplied by the GS HIMAD BOC.
- 2) Its mission and fire control orders received from the TOC.
- 3) Reports of location and unit situation status from the SHORAD batteries.
- 4) Reports of equipment status from the SHORAD platoon and FAAR platoon through the SHORAD batteries.
- 5) Reports of engaging a target or sighting a target which was not engaged, from the SHORAD squads or Stinger teams.

Information feedback includes reports on unit operational status and progress of the air battle, sent to the GOC.

A.1.1.5.2

Division Control Units

A division commander normally places an attached ADA unit under the operational control of the division's organic air defense battalion.

A.1.1.5.2.1

GSR HIMAD BOC

Medium range weapons are normally placed in direct support of divisions in order to facilitate centralized direction of the air battle.

In exercising its command and control capability, the GSR HIMAD BOC commander makes these decisions:

- 1) Planning and ordering the movement of its batteries and firing units.
- 2) Tasking HIMAD firing units, through the batteries.
- 3) Assigning targets to firing units.
- 4) Planning HIMAD defenses in support of SHORAD ADA plans.

The information needed in making these decisions comes from five sources, 1) the GOC, which provides the BOC with its mission, fire control orders, and target information; 2) the TOC of the division that the HIMAD battalion is reinforcing, which informs the HIMAD battalion of its initial task organization and disposition of ADA units, the status of other ADA units in the area, and sectors of fire and PTL for HIMAD weapons; 3) the DTOC which reports friendly and enemy aircraft information; 4) the GSR HIMAD BOC's internal sources, which include its Missile Minder computer system and its intelligence section for information on the ground and air situation, and 5) the GSR HIMAD battery, which reports its location as well as its unit and equipment status.

Information feedback includes reports on unit operational status and progress of the air battle, sent to the GOC.

A.1.1.1.5.2.2      SHORAD BN TOC

The SHORAD BN is organic to the maneuver division. Its information feedback to higher control units consists of reports to the DTOC on unit operational status and the progress of the air battle.

The decisions for which the SHORAD BN TOC is responsible are the following:

- 1) Planning and ordering the movement of its batteries, based on the current DEFCON
- 2) Establishing sectors of fire and PTL for each HIMAD SHORAD, and DIVAD Gun/Missile weapon in its area.
- 3) Advising the division commander on air defense priorities.

In making the above decisions, the SHORAD BN TOC considers information from several sources: The GSR HIMAD BOC sends long range early warning as well as enemy and friendly aircraft information; DTOC sends a more restrictive weapons control status when necessary, information on the division mission and air defense needs, the criticality of the assets it is to defend, and airspace plans; [DIVARTY sends artillery plans, status, and activities]; the SHORAD and FAAR platoons send equipment status reports; the SHORAD battery sends unit status and location reports; the DIVAD Gun/Stinger battery sends a unit status report; and the SHORAD squad or Stinger team sends a report of engaging and/or sighting a target through the SHORAD battery.

A.1.1.2            Red Command and Control

A.1.1.2.1        Maneuver Control Command and Control

A tactical headquarters (HQ) organization is organic to each combat echelon of the Soviet Ground Forces. Headquarters from division level and higher are basically organized in the same manner but on a different scale. For example, an Army HQ has approximately three times the personnel of division HQ. HQ personnel at division level and higher include:

- 1) The commander with overall responsibility for his forces.
- 2) The commander's staff (operations, intelligence, personnel, etc.) responsible for day-to-day direction of subordinate units.
- 3) Political and technical directorates responsible, respectively, for the political education of the troops and the technical aspects of the various combat and combat support arms (tank, artillery and rocket, air defense, engineer, signal, and chemical troops).
- 4) Supply directorates and logistics staff responsible, respectively, for the procurement and supply of weapons and technical equipment and the proper functioning of rear area services.

In each Soviet HQ, control is exercised by the establishment of a series of command posts (CP). These usually consist of a Main, a Forward, a Rear, and (at division level and above) an Alternate CP. These command posts are discussed below.

A.1.1.2.1.1      Army Echelon

A.1.1.2.1.1.1    Army Forward Command Post

Battle Planning/Situation Assessment

The Army Forward CP is used by the commander to monitor, observe, and give prompt direction to the subordinate division commanders fighting the immediate battle.

Communications

The Army Forward CP uses vehicle-mounted tactical radios to receive up-to-date situation assessments and to issue immediate combat orders. Communications contact is maintained with headquarters of the subordinate divisions, Army Main CP, air support and fire support command elements, and other Army action units.

Movement

The Army Forward CP is a mobile command post normally consisting of a group of camouflaged or concealed APCs, armored command vehicles, and communication vans. These can rapidly displace as the situation requires.

Personnel

These typically include the commander, staff officers from the operations directorate, intelligence directorate, air and artillery liaison officers, and communications personnel.

Command and Control

The range of decisions made from the Army Forward CP include:

- 1) Possible adjustments of resource allocations to divisions in support of the immediate battle.

- 2) Positioning and coordination of major units in support of the immediate battle.

The Forward CP commander and staff consider the following in making these decisions:

- 1) Critical status reports from CPs of subordinate divisions.
- 2) Requests for immediate support from division commanders.
- 3) Combat reports of immediate concern from Front/ division main CPs and lateral headquarters.

The Forward CP relays combat information to the Front, Army and Division Main CPS.

#### A.1.1.2.1.1.2 Army Main Command Post

##### Battle Planning/Situation Assessment

The Army Main CP uses the Army staff's first directorate (Operations) for battle planning, aided by the second directorate (Intelligence) for intelligence and situation assessments.

##### Communications

The Army Main CP uses teletype systems, wire, radio relay, radios and messengers. Where possible, the main CP will locate in a town with good communications facilities. Communications traffic is continuous between Army Main and Army Forward as well as to all subordinate division headquarters. Other nets provide communications from Army Main to air defense, missile, and artillery command elements, attached air regiments or divisions, and other combat support elements. Communications installation, maintenance, and support is provided by elements of the signal regiment.

### Movement

Camouflaged and dispersed about the CP area will be APCs, armored command vehicles, and communications vans. In addition, a camouflaged truck park may be 1-2 km from the Main CP. The Army Alternate CP will provide continuity of operations while the Main CP is moving.

### Personnel

The personnel at Army Main CP include the commander (when not at the Forward CP), chief of staff, majority of the staff of the operations and intelligence directorates, chiefs of the technical directorates (tanks, artillery and missiles, etc.), chiefs of the combat support arms (air defense, signal, chemical, etc.), their staffs, communications personnel, and headquarters support personnel. The chief of staff is in charge of Army Main when the commander is at his forward CP.

### Command and Control

The Army commander makes the following range of decisions aided by his staff:

- 1) Broad positioning of major units.
- 2) On-going adjustments to resource allocation, scheme of maneuver, and task organization of major units.
- 3) Planning and coordination of major units and their associated combat support elements.

These decisions are disseminated to the division Main CPs, chiefs of the combat support arms (artillery, air defense, engineers, etc.) at Army/division level, and attached air staff.

In making these decisions, the Army Main CP consider the following:

- 1) Directives from higher headquarters.
- 2) Mission tasking from the Army operation orders in effect.
- 3) Status reports from subordinate units.
- 4) Weather and terrain reports.
- 5) Combat intelligence from subordinate and lateral units.
- 6) Support requests from subordinate divisions.

Information fed to higher headquarters consists of the following:

- 1) Requests for additional assets or intelligence support.
- 2) Condensed unit action/status reports.

#### A.1.1.2.1.1.3      Army Rear Command Post

##### Rear Area Planning/Direction

Rear services, responsible for logistics and administrative functions are found at the Army Rear CP. The Rear CP is tasked with planning and direction to ensure:

- 1) Uninterrupted supply of munitions, fuel, clothing, and weapons to the divisions.

- 2) Upkeep and maintenance of tracked and wheeled vehicles and to recover damaged vehicles.
- 3) Maintenance and repair of weapons and equipment.
- 4) Execution of all transport operations to fulfill the above tasks.
- 5) Provision for medical services, medical supplies, transport of wounded, and establishment and maintenance of field hospitals.
- 6) Establishment and maintenance of depots.
- 7) Rear area combat security.

Communications

The Army Rear CP has its own administrative and logistics net over which it maintains contact with the Army Main CP and subordinate logistics elements. Communications means include teletype systems, wire, tactical radios and messengers.

Personnel

The Rear CP is commanded by the Chief of Rear Services and contains supply, administrative, political, and security personnel.

Command and Control

Decisions made by the Army Rear CP relate to:

- 1) Requests to combat service support sources of supply above Army level for personnel replacement, major end item replacement, maintenance and medical evacuation.

- 2) Resource allocation to subordinate CSS units and to rear area security elements.
- 3) Coordination of movement and traffic control in the Army rear area.

A.1.1.2.1.1.4      Army Alternate Command Post

The Alternate CP monitors the communications traffic of the Main CP for the purposes of situation assessment and movement. It is prepared to take over the function of Army Main in the event of loss or damage to the Main. The Alternate CP also serves as a temporary Main during the Main's displacement. The Alternate CP is normally manned by the deputy Army commander, deputy chief of staff, and selected personnel from the Army staff, combat, and combat support branches, and communications.

A.1.1.2.1.2      Division Echelon

A.1.1.2.1.2.1      Division Forward Command Post

Battle Direction/Situation Assessment

The Division Forward CP is used by the division commander to monitor and direct the immediate battle, aided by up-to-date situation assessments made by the Forward CP staff.

Communications

The Forward CP uses vehicle-mounted tactical radios to receive situation assessments and to issue verbal instructions. The CP maintains contact with its subordinate regiments, the Division Main CP, fire support command elements, and other division combat and combat support units.

Movement

The Forward CP is a mobile command post normally consisting of a group of camouflaged or concealed command tanks, APCs or specially

configured armored command vehicles (ACVs), and communications vans. These can rapidly displace as the situation requires.

Personnel

Forward CP personnel typically include the division commander, operations and intelligence officers (from the first and second groups of the division staff), fire support liaison officers, and communications personnel.

Command and Control

The range of decisions made from the Division Forward CP include:

- 1) On-going adjustments of resource allocation to regiments and battalions in support of the immediate battle.
- 2) Positioning of division engineer, reconnaissance and fire support units in support of the immediate battle.
- 3) Adjustments to the positioning of maneuver regiments and battalions within the division.

The Forward CP considers the following in making these decisions:

- 1) Mission tasking in effect from higher headquarters.
- 2) Critical status and situation reports from the CPs of subordinate regiments.
- 3) Requests from regimental commanders for immediate support.

- 4) Combat intelligence reports.
- 5) Reports on the operations of adjacent divisions.

The Forward CP relays combat reports to Army, Division and Regimental Main CPs, and requests for immediate support to Army Main CP.

A.1.1.2.1.2.2     Division Main Command Post

Battle Planning/Situation Assessment

The Division Main CP uses its headquarters staff to plan for the future battle and to make intelligence and situation assessments. The division staff develops an operation plan for the division based on decisions by the commander and consistent with directives from higher headquarters.

Communications

The Division Main CP has its own communications center staffed by personnel from division signal battalion. Means of communication include teletype, wire, radio relay, tactical radios, and messengers. Main headquarters communicates with Front and Army command, rear, alternate, and forward division headquarters, as well as motorized rifle and tank regiment CPs and the command elements of all other units organic to the division.

Movement

Adjacent to the Main CP area may be a camouflaged truck park containing about 30 vehicles dispersed over a 1 km<sup>2</sup> area. These are used to move headquarters personnel and equipment. The CP area will also contain concealed APCs, command vehicles, and communications vans. The Division Alternate CP will provide continuity of operations while the Main is moving.

Personnel

Personnel at Division Main include the commander (when not at the forward CP), division chief of staff, majority of the staff of the operations and intelligence groups, chiefs of the technical groups and combat

support arms, their staffs, and communications and headquarters support personnel. The chief of staff is usually in charge of Division Main when the commander is at his forward CP.

Command and Control

The command staff at the Main CP develops the division operation plan for the direction of division and regimental level action units. Included in the plan are resource allocation decisions, task organization of subordinate maneuver units, scheme of maneuver, coordinated movement plans for major action units and their associated air defense and combat support elements. The Main CP also coordinates future division operational support with the Army Main CP and develops the division fire plan in cooperation with the Chief of Rocket Troops and Artillery (CRTA), his staff, and the air liaison group.

In formulating these plans, the division commander uses the following considerations:

- 1) Directives from Front headquarters.
- 2) Mission assignment from Army headquarters.
- 3) Combat unit action and status reports.
- 4) Weather and terrain reports.
- 5) Intelligence reports from subordinate and lateral units.

The Division Main CP will transmit the following items to higher or lateral headquarters as information feedback:

- 1) Request for approval of the operation plan.

- 2) Requests for additional support (to Army Main CP).
- 3) Combat unit status reports (to Army Main CP).
- 4) Operation Plan sent to the Division Rear CP for coordination with Division Rear plans for combat security.

Combat orders may be transmitted to the maneuver units and combat support units before the distribution of the division operation plan.

A.1.1.2.1.2.3      Division Rear Command Post

Rear Area Planning/Direction

The Rear CP staff is tasked with planning and direction to ensure:

- 1) Supply of munitions, fuel, clothing and weapons to the maneuver regiments and combat support units.
- 2) Upkeep and maintenance of the division's vehicles and recovery of damaged vehicles.
- 3) Maintenance and repair of weapons and equipment in the division.
- 4) Execution of transport operations to carry out the above tasks.
- 5) Provision for medical services, medical supplies, transport of wounded, and establishment and maintenance of field hospitals.
- 6) Rear area combat security.

### Communications

The Division Rear CP has its own administrative and logistics net over which it maintains contact with the Division Main CP, subordinate logistics elements and sources of supply above division. It uses teletype, wire, tactical radios and messengers.

### Personnel

The Division Rear CP is commanded by the division's Chief of Rear Services and contains supply, administrative, political, and security personnel.

### Command and Control

Decisions made by the Rear CP relate to:

- 1) Requests to CSS sources of supply above division level for fuel and ammunition replenishment, major end item replacement, maintenance and medical evacuation.
- 2) Resource allocation to subordinate CSS units and to rear area security units.
- 3) Coordination of movement and traffic control in the division rear area.

#### A.1.1.2.1.2.4      Division Alternate Command Post

The Alternate CP monitors the communications traffic of the Main CP for the purposes of situation assessment and movement. It is prepared to take over the function of the Division Main CP in the event of loss or damage to the Main. The Alternate CP also serves as a temporary Main during the Main's displacement. The Alternate CP is normally manned by the deputy division commander, deputy division chief of staff, deputy chief of artillery, other officers detailed from the division staff, and communications and headquarters support personnel.

A.1.1.2.1.3      Regimental Echelon

A.1.1.2.1.3.1      Regimental Forward CP

During the immediate battle, the regimental commander is normally located in a mobile, forward command post to better observe and direct the battle. This CP consists of a small group of armored command vehicles and communications vans. A small staff of about 10 people plus attached signal elements will accompany the commander. Using tactical radios, the Forward CP communicates with headquarters elements of maneuver battalions and the Regimental Main CP. The Forward CP can act as the Regimental Main CP while the Main displaces. Below division, there is normally no Alternate CP.

A.1.1.2.1.3.2      Regimental Main CP

Battle Planning/Direction/Situation Assessment

The regimental commander, assisted by his staff, does battle planning, direction, and situation assessment in support of the near-term battle.

Communications

Regimental Main has its own signal center for radio relay and teletype transmission. Messengers and tactical radios are also used extensively. The CP communicates with Army and division headquarters, as well as maintaining separate command and control nets for communicating with its maneuver battalions and other organic elements.

Movement

Four to six vehicles are normally associated with a Regimental Main CP. These consist of command tanks, APCs or armored command vehicles. Additional trucks and communications vans are provided by signal units. When the Regimental Main CP is displacing, its functions are taken over by the Forward CP.

Personnel

These include the commander or his chief of staff, intelligence and operations staff, liaison elements, and communications personnel.

Command and Control

In planning for the near term battle, the Regimental commander makes the following range of decisions:

- 1) Positions maneuver battalions, air defense, artillery and other combat support elements for the immediate battle.
- 2) Allocates resources to maneuver battalions in support of the immediate battle.
- 3) Organizes maneuver unit task forces for anticipated operations.

The following are considerations in making the above decisions:

- 1) Decisions of the regimental commander.
- 2) Combat mission assigned to the regiment from division headquarters.
- 3) Status of the maneuver battalions.
- 4) Support requests from the battalions.
- 5) Intelligence reports from reconnaissance and I/EW elements.

- 6) Combat reports from battalion units in contact with the enemy.

The Regimental Main CP staff sends to division headquarters the following information:

- 1) Requests for immediate support.
- 2) Combat and intelligence reports of immediate importance.
- 3) Action unit status reports.
- 4) Proposed battle plans.

A.1.1.2.1.3.3      Regimental Rear CP

The regimental Chief of Rear Services and his administrative and supply staff at the Rear CP are tasked with stocking and distributing medical supplies, ammunition and rations, and establishing maintenance facilities, supply points and POL depots in the regimental rear area. The Rear CP commander is also responsible for allocating resources to rear area security elements. Communication with the Regimental Main CP, CSS elements of subordinate battalions, and sources of supply above regiment are by means of tactical radios (using the administrative/logistics net) and messengers.

A.1.1.2.1.4      Battalion Headquarters

Battalion headquarters is the control element for subordinate tank and motorized rifle companies and fire support units attached to the battalion. Headquarters personnel include the battalion commander, deputy commander, operations officer (who is also chief of staff), intelligence officer, and signal officer plus 8-10 enlisted men for headquarters support. A supply officer is in charge of the mobile supply

point in the battalion's rear area. Liaison officers from supporting artillery, engineer, air defense elements, etc., will also be attached to the headquarters.

The headquarters is normally organized into a Forward CP and a Main CP. The commander observes the battle from the Forward CP (an APC or command tank) located in the rear of one of the leading companies. An engineer or artillery officer may accompany him along with several communications personnel. The rest of the staff generally functions from the Main CP coordinating the battle.

#### Communications

Radio contact is maintained with subordinate companies, attached fire support elements, and regimental headquarters. Battalion HQ also has field telephones and a switchboard operated by personnel of the signal platoon.

#### Movement

The headquarters is highly mobile containing two or three APCs and armored command vehicles plus a truck and communications jeep. Signal and liaison personnel supply their own vehicles.

#### A.1.1.2.2

#### Intelligence/Electronic Warfare Command and Control

Soviet I/EW assets are concentrated at Front and Army levels to ensure centralized control. Divisions and regiments rely on their organic reconnaissance battalions and companies to provide combat intelligence.

#### A.1.1.2.2.1

#### Army Echelon

In addition to the Army's organic I/EW assets, those Front I/EW assets operating in the Army area would probably come under the operational control of the Army commander.

A.1.1.2.2.1.1      Army Headquarters

The management of I/EW assets is the responsibility of the second department (intelligence) of the Army staff. I/EW assets are primarily those of collection and jamming. The range of I/EW-related tasks performed by the second department staff probably include:

- 1) Allocation, positioning, and tasking of Army level collection assets (sensors, direction finders, radio/radar intercept equipment, etc.).
- 2) Tasking of Army level jammers.
- 3) Evaluation of sensor reports to determine information of use to the force commander.
- 4) Dissemination of useful information to the Army commander, Front headquarters, and division headquarters.

Communications

Army intelligence staff maintains communications with the command elements of the subordinate signal intercept, jamming and combat intelligence units, division intelligence staffs and Front HQ. Means include tactical radios, the Army signal center (at Army Main CP), and messengers.

Movement

The second department of the Army staff displaces with the Army Main CP.

A.1.1.2.2.1.2      Radio Electronic Combat Battalion (REC) Headquarters

The REC battalion commander employs intensive jamming and deception to nullify, delay or disrupt the enemy's command, control, and

weapon system communications. This battalion is the parent unit for radio and radar jammers. The headquarters provides resupply, maintenance, logistical, and administrative support. It keeps detailed accounts of jamming system locations and status but probably does not generate mission tasking.

Communications

REC battalion HQ personnel communicate with the intelligence staff at the Army Main CP, and its subordinate radio electronic combat companies by means of tactical radio.

A.1.1.2.2.1.3      Signal Intercept Battalion Headquarters

The assets involved for the collection of signals intelligence (SIGINT) include communications intelligence (COMINT) sensors found in the radio intercept company and the electronic intelligence (ELINT) sensors of the radar intercept and direction finding company. There is also a radio direction finding company. SIGINT collection missions probably originate with the second department of the Army staff. The battalion headquarters would act as an administrative and logistical support center, providing the intelligence staff at Army HQ with sensor location and status reports.

Communications

Tactical radios are used to communicate with the subordinate SIGINT collection companies.

A.1.1.2.2.1.4      Combat Intelligence Battalion Headquarters

This battalion includes an intelligence collection company and an interrogation company. A long range reconnaissance company may also be part of this battalion. The function of the battalion is to contribute to the quality of enemy situation assessment. The headquarters provides administrative control and logistics support for the subordinate companies.

Combat intelligence and enemy situation reports are collected and passed to the second department of the Army staff. Communications with subordinate companies are by means of tactical radio.

A.1.1.2.2.2      Division Echelon

Front and Army level I/EW assets operating in the division area would probably come under the operational control of the division commander. The division's primary organic intelligence assets are the reconnaissance battalion and target acquisition battery of the artillery regiment.

A.1.1.2.2.2.1      Division Headquarters

The management of I/EW assets at this level is the responsibility of the second group (intelligence) of the division staff. Jamming assets would be allocated from higher headquarters. The division's organic collection assets include ground surveillance radars, artillery radars, and SIGINT sensors of the reconnaissance battalion. These assets can be augmented by SIGINT sensors and direction finding equipment tasked by higher headquarters to operate in the division area. The division intelligence staff would position and task its I/EW assets (in conformity with the division operation plan and the commander's guidance) to meet general intelligence requirements. Combat intelligence, reconnaissance reports and sensor data would be evaluated and integrated into the situation assessment given to the division commander.

Information passed to higher headquarters would include combat intelligence of a significant nature, requests for collection assistance, and the status of collection tasks previously assigned to the division.

### Communications

The division intelligence staff communicates with higher headquarters and the command elements of attached and organic division intelligence assets including the reconnaissance battalion. Communications means include tactical radios, the division signal center at the main command post, and messengers.

### Movement

The second group of the division staff will displace with the Division Main CP.

#### A.1.1.2.2.2 Reconnaissance Battalion Headquarters

The reconnaissance battalion has the capability to perform troop reconnaissance, long range reconnaissance, and SIGINT. Mission tasking is generated at division headquarters. The battalion HQ provides administrative control and logistics support for its subordinate companies. Information on enemy troop locations, headquarters, force composition, communications centers, etc. is passed to the division intelligence staff. Communications with the reconnaissance companies is primarily by tactical radios.

#### A.1.1.2.2.3 Regimental Echelon

The regiment does not have organic I/EW assets except for its reconnaissance company.

#### A.1.1.2.2.3.1 Regimental Headquarters

The regimental intelligence officer probably coordinates with, or is tasked by the division intelligence officer to collect specific intelligence data in the regiment's area of operations. In turn, the intelligence officer can issue intelligence collection requirements to the maneuver battalions and the reconnaissance company. It is probable that the

collection and jamming assets operating in the regimental area can provide support to the regimental intelligence officer when this does not conflict with Army or division I/EW mission tasking. Presumably, higher headquarters can also attach I/EW assets to the regiment which the intelligence officer can task directly. The intelligence officer would feed back requests to division HQ for I/EW support, and would also transmit combat information from reconnaissance patrols and I/EW status reports.

#### Communications

The intelligence officer uses tactical radios, the regimental signal center, and messengers.

#### Movement

The regimental intelligence staff will displace with the Main CP.

#### A.1.1.2.3        Fire Support Command and Control

Fire support is the collective employment of artillery, rocket, and air assets in support of the battle plan. These weapon systems are a significant part of the total fire support system that provides long-range, responsive, flexible combat power. Threat command and control of artillery and rocket assets are loosely linked to maneuver elements. Threat air assets are centralized at higher echelons, but staff elements support a complete, integrated fire support plan.

#### A.1.1.2.3.1      Artillery

- 1)      Temporary mission-oriented artillery groups are established in order to assure flexibility in concentrating artillery fire.
- 2)      Artillery is formed into Army, division, and regimental artillery groups.

- 3) An artillery group usually consists of two to four battalions and may include mortars, field guns, howitzers, and multiple rocket launchers.
- 4) Command and staff elements of the artillery group are drawn from the available personnel of the maneuver force artillery.

A.1.1.2.3.1.1    Army Echelon

Decisions made by the Army commander relating to the allocation and employment of artillery are based on recommendations of his Chief of Rocket Troops and Artillery (CRTA). The CRTA and his staff work with the Army chief of staff and the air staff to prepare an integrated fire support plan. Generally, the following occurs:

- 1) Artillery assets from higher headquarters (Front) are normally allocated among first echelon armies.
- 2) The Army commander will allocate his artillery assets to first echelon divisions.
- 3) Any remaining artillery may be formed into an Army Artillery Group.

A.1.1.2.3.1.1.1    Army Artillery Group (AAG) HQ  
Assessment/Planning Direction

This HQ is seldom formed. However, if formed, the commander and staff located there would perform:

- 1) Situation assessment.

- 2) Planning and coordination of counterbattery missions.
- 3) Target identification and selection.
- 4) Assignment of priority of fires.
- 5) Assignment of counterbattery targets to AAG fire support assets.
- 6) Transmission of Army fire support plan to artillery units under its control.
- 7) Coordination of the movement of AAG fire support assets.
- 8) An AAG, if formed, assumes the primary counterfire mission for the Army.

Communications

The AAG commander transmits situation reports to the CRTA at Army HQ and target assignments to the artillery battalions. AAG HQ relies on radio, wire, and messengers for communications.

A.1.1.2.3.1.1.2 Battalion Headquarters

Each artillery battalion consists of a headquarters and headquarters platoon, three firing batteries (six tubes per battery), and a supply and maintenance platoon. The battalion headquarters acts as a fire direction center (FDC) and the commander exercises command and control over the subordinate batteries. The range of decisions includes positioning the batteries and coordinating and directing their fire. The battalion CP maintains contact with the AAG HQ and the firing batteries by means of radio or wire.

A.1.1.2.3.1.1.3 Target Acquisition Battery

The principle function of the target acquisition battery (TAB) personnel (commander and staff) at this echelon is to acquire counterbattery targets using their radar section and sound/flash ranging platoon. Movement and positioning of the TAB is probably controlled by the Army artillery group HQ with whom it communicates using radios.

A.1.1.2.3.1.1.4 SCUD Brigade HQ

The SCUD is a ballistic missile capable of delivering a nuclear or chemical warhead to a range of 280 km. One SCUD brigade is found at Army level. The brigade command post is normally located within 20 km of the Army Main CP to facilitate radio contact. The CP consists of the command staff plus signal and fire control personnel. About 6-8 vans, trucks and communications vehicles are camouflaged and dispersed about the command post area. The brigade CP receives fire missions from Army or Front headquarters via wire and/or radio link. Firing data is then transmitted from the brigade CP to the appropriate SCUD battalion.

A.1.1.2.3.1.1.5 SCUD Battalion HQ

The command post is normally situated in an area central to the launch elements of the battalion. Personnel there consist of the SCUD battalion commander, his staff plus communications and fire control personnel. They are housed in vans containing data displays, computing equipment, and communications gear. The command post receives weather data from the meteorological section, relays fire orders from SCUD brigade HQ to the appropriate launch units, and acts as a fire direction center. Communications are by radio or wire.

A.1.1.2.3.1.2      Division Echelon

The division commander exercises authority over all organic and allocated artillery within the division. His decisions relating to the employment of artillery are based on recommendations of the division CRTA. The CRTA and his staff work with the division chief of staff and the air liaison group to prepare the division fire support plan and to assure its coordination with cooperating air and ground combat elements.

- 1)      The division commander will allocate artillery units to leading regiments on the main axis of attack.
- 2)      The division commander will form one or more Division Artillery Groups (DAGs) with his retained artillery.
- 3)      The DAG is employed in general support of the division assisting the Army in counterfire missions.
- 4)      The division commander, through his CRTA, can release individual battalions from artillery groups and form new groups as the situation requires.
- 5)      The division commander can assign specific artillery units to support designated maneuver units.

A.1.1.2.3.1.2.1    Division Artillery Group (DAG) HQ  
Assessment/Planning/Direction

Tasks performed and decisions made by the DAG HQ commander probably include:

- 1)      Situation assessment and coordination of artillery fire support for the division within the DAG.

- 2) Assignment of targets to fire support assets within the DAG.
- 3) Transmission of the artillery fire support plan to the units under DAG control.
- 4) General position guidance for the firing battalions and target acquisition battery (TAB).

The DAG commander is guided in his decisions by:

- 1) Decisions of the division commander and the Chief of Rocket Troops and Artillery (CRTA).
- 2) Status of the firing units and the TAB.
- 3) Target intelligence generated by the division staff or received from observers and TAB assets.
- 4) Division fire plan and operational orders currently in effect.

#### Location and Movement

The command post is normally located near the division CP. CP vehicles include a computer van, communications van, APC or armored command vehicle, and trucks.

#### Communications

DAG HQ maintains communications with division headquarters (Main), the target acquisition battery (TAB), and the firing battalions of the DAG. The DAG commander reports directly to the division CRTA. Communications means include wire, radio, and messengers.

#### A.1.1.2.3.1.2.2 Artillery Battalion Headquarters

Battalion HQ acts as a fire direction center (FDC) as well as exercising command and control over its batteries. The CP maintains communications by wire and radio with DAG headquarters and the subordinate firing batteries.

#### A.1.1.2.3.1.2.3 Target Acquisition Battery (TAB)

The principal function of the TAB is the acquisition of targets, particularly enemy artillery. Movement and positioning of the TAB is probably controlled by DAG HQ to provide continuity of coverage. Assets for target acquisition include the counterbattery radar section and the sound/flash ranging platoon. The TAB reports enemy location, activity, and other data to DAG HQ using radios.

#### A.1.1.2.3.1.2.4 FROG-7 Battalion HQ

The FROG-7 (Free Rocket Over Ground) is a surface-to-surface missile which is capable of delivering a nuclear/chemical/conventional payload to a range exceeding 60 km. A FROG battalion is organic to each tank and motorized rifle division. The battalion headquarters command post is normally located within 20 km of division main headquarters for ease of communications. The CP consists of the FROG battalion command group, a small staff, plus communications and plotting personnel. They are housed in a group of armored vehicles and vans containing communications and computing equipment. The FROG battalion commander coordinates firing positions, directs launch preparations, and the CP acts as a fire direction center. Radio contact is maintained with the launch battery CPs, the meteorological unit, and the Division Main CP. Fire missions are received from the division or directly from Army headquarters.

A.1.1.2.3.1.3

Regimental Echelon

Regimental Artillery Groups (RAGs) are formed by the division commander from organic and attached non-divisional artillery assets. A RAG is assigned to provide support to each of the first echelon maneuver regiments. The RAG destroys targets which hinder the advance of its own supported regiment. The RAG usually consists of two to four artillery battalions. In general,

- 1) The regimental commander may allocate up to a battalion of artillery (18 guns) to each of his first echelon maneuver battalions.
- 2) An allocated artillery battalion is either in attached or support status.
- 3) An attached artillery battalion is under the operational control of the motorized rifle (tank) battalion commander and can undertake fire missions for specific companies.
- 4) A supporting artillery battalion remains subordinate to its parent RAG but will execute fire missions for the supported maneuver battalion commander when not firing RAG missions.
- 5) A company commander may not request fire support from the battery of an artillery battalion in support status.

A.1.1.2.3.1.3.1    Regimental Artillery Group (RAG) HQ

Assessment/Planning/Direction

Personnel at the RAG HQ probably have primary functions of communications and command and control. These include:

- 1) Coordination of artillery fire support within the RAG.
- 2) Transmission of target assignments to fire support assets.
- 3) General position guidance for the firing battalions.

The RAG commander is guided in his decisions by:

- 1) Decisions of the division commander, regimental commander, and the Chief of Rocket Troops and Artillery (CRTA).
- 2) Status of firing units.
- 3) Target intelligence developed from the staff or received from observers and TAB assets.
- 4) The regimental fire plan and operational orders currently in effect.

Location and Movement

The command post is normally located near the regimental CP. Vehicles probably include a computer van, communications van, and an armored command vehicle. The RAG commander may utilize an APC or light tracked artillery tractor for fire direction and observation.

### Communications

The RAG CP maintains communications with the headquarters of the supported maneuver regiment and the CRTA at division HQ. It also communicates with the RAG fire support assets on a separate net. Principal means of communication include radio, messenger, and wire.

#### A.1.1.2.3.1.3.2 Artillery Battalion Headquarters

Battalion HQ acts as a fire direction center as well as exercising command and control over its batteries. The major part of the command group of an attached artillery battalion is located near the CP of the supported maneuver battalion. The artillery battalion CP maintains contact by wire and radio with RAG headquarters, the headquarters of the unit to which it is attached or which it is supporting, and the subordinate firing batteries.

#### A.1.1.2.3.2 Air Support

##### A.1.1.2.3.2.1 Command and Control of Frontal Aviation

A tactical air Army (TAA) would be assigned to each Soviet Front headquarters. Administratively, a TAA, as part of Frontal aviation, is an Air Force asset. However, its relationship to the Air Force is strictly one of administration, maintenance, and logistics. A TAA would be under the operational control of the Front commander in the event of war. The air Army commander (an Air Force general-colonel) would function as Deputy Commander for Air under the Front commander. In general,

- 1) As a result of their World War II experiences, the Soviets centralize their air assets at Front level.
- 2) Tactical air Army headquarters is usually colocated with Front headquarters.

- 3) TAA HQ is connected by radio links and landlines to fighter and bomber divisions, helicopter regiments, air reconnaissance regiments, and the Soviet High Command.
- 4) The Front commander may place certain air divisions and/or regiments under the operational control of his subordinate armies.
- 5) Commanders of ground armies would have operational control over any air assets assigned to them by the Front commander while logistics and administration would operate through Air Force channels.

#### A.1.1.2.3.2.2      Army Echelon

If air assets (primarily helicopter regiments) are operationally assigned to an Army headquarters, air planning/liaison functions would be performed by the commander and staff of the supporting aviation formation. Otherwise, a liaison group would be assigned to assist and coordinate air operations headed by an Air Force general-major or general-lieutenant (who is probably a deputy commander of the TAA of the Front). The following functions are performed:

- 1) Chief of the air liaison group advises the ground Army commander on general air matters.
- 2) A section of the air liaison staff works with the Army chief of staff to help prepare the air support annex of the fire support plan and to provide proper air to ground coordination during the battle.

- 3) Another section of the air liaison group provides the interface between the air units and forward air controllers.

Communications are maintained with the supporting air regiments, TAA headquarters, and liaison elements at division HQ.

#### A.1.1.2.3.2.2.1 Tactical Air Regiment HQ

If there is no disapproval at the headquarters of the supported ground force formation (Army or division), a direct support request is sent to the supporting air regiment headquarters (located at an airfield) where it is processed. Air regiment headquarters retains control of en route support aircraft until they are passed to the forward air controller of the ground unit requesting support. Air regiment HQ maintains communications with the HQ of its parent air division, the HQ of the supported ground formation, and en route aircraft.

#### A.1.1.2.3.2.3 Division Echelon

At ground force division headquarters the air liaison staff functions in the same manner at the division level as was described in A.1.1.1.3.2.2. Communications are maintained with the forward air controller and the liaison elements of the supporting air formation.

#### A.1.1.2.3.2.4 Regimental Echelon

The lowest level at which there seems to be a formal air-to-ground interface is at the maneuver regiment. At this level, a forward air controller stationed in a tank or other armored vehicle maintains radio communications with higher headquarters regarding air support requests, provides last minute details on the target and nearby friendly troops, and advises the ground regiment commander on the employment and availability of aircraft.

A.1.1.2.4

Combat Service Support Command and Control

The Chief of Rear Services is present at each command level down to regiment. He is the senior logistical officer directly responsible for the day-to-day administration and management of the military logistic system. He exercises control through a staff composed of officers from combat support, supply, and technical services personnel.

The Soviet logistic system is based upon the "push" system wherein each higher echelon is responsible for supplying and maintaining its immediately subordinate echelon. When required, echelons can be bypassed to expedite delivery to the next lower echelon. For example, Army-level trucks can deliver supplies directly to regiments.

The Chief of Rear Services and his staff are normally found at the rear command post of each echelon down through regiment. Rear command posts are covered in subsections A.1.1.2.1.1.3, A.1.1.2.1.2.3, and A.1.1.2.1.3.3.

A.1.1.2.4.1

Army Echelon

A.1.1.2.4.1.1

Staff Organization

The staff of rear services is divided into the following departments:

- 1) Food
- 2) Clothing and (Personal) Equipment
- 3) Fuel and Lubricants
- 4) Medical Services
- 5) Veterinary Services

The above departments are tasked with ordering, storing, and distributing the appropriate items in their respective areas of responsibility. In addition, the chiefs of the various special troops are responsible for ordering, storing, distributing, and maintaining all vehicles and technical equipment associated with their respective branches. These chiefs include:

- 1) Chief of Motor Transport
- 2) Chief of Engineer Troops
- 3) Chief of Signal Troops
- 4) Chief of Chemical Troops

The user units are responsible for supplying ammunition and maintaining weapons and combat equipment. In particular:

- 1) The Chief of Rocket Troops and Artillery is responsible for the delivery, storage, and repair of artillery weapons, mortars, tank weapons, antitank weapons, air defense weapons, and small arms. He is also responsible for all types of ammunition and lubricants used in maintaining weapons.
- 2) The Deputy for Technical Matters is responsible for supplying and maintaining all armored combat vehicles, armored personnel carriers, and self-propelled artillery vehicles (the weapons on the vehicles are the responsibility of the Chief of Rocket Troops and Artillery). He is also responsible for the maintenance and repair of motor vehicles.

#### A.1.1.2.4.1.2      Army Depots

Depots are commanded by a logistics officer who is assisted by branch depot chiefs. Depots are located 70-120 km behind the FEBA near

railroad lines or road nets. When necessary, mobile forward supply bases will be established immediately behind first echelon divisions (30-50 km from the FEBA). These may contain two days worth of stocks. Forward delivery will be accomplished by Army level trucks.

Depots are classified according to type of supply which includes:

- 1) Artillery and Small Arms
- 2) Fuel and Lubricants
- 3) Armored Equipment
- 4) Technical Equipment
- 5) Food
- 6) Clothing

Depots are utilized for the purposes of:

- 1) Storage and issuing of materiel, weapons, and equipment.
- 2) Reception from forward units of captured, surplus, and inoperative weapons, equipment, and materiel and their preparation for shipment to appropriate higher depots or workshops.

In addition, fixed and mobile repair facilities are provided for the major repair and overhaul of vehicles and equipment.

#### A.1.1.2.4.1.3      Motor Transport Regiment Headquarters

The commander of this headquarters oversees the transport and delivery of mobile stocks from Army depots and the removal of weapons and equipment requiring repair.

A.1.1.2.4.1.4      Medical Regiment Headquarters

The commander of this headquarters provides administrative control for a group of field hospitals operated by the regiment.

A.1.1.2.4.2      Division Echelon

A.1.1.2.4.2.1      Staff Organization

The rear services staff organization at division level parallels that of Army level except it is organized on a smaller scale.

A.1.1.2.4.2.2      Division Depots

Division depots are mobile with stocks generally kept loaded on trucks. Generally, 3-5 days of ammunition are stored in division depots along with rations and fuel. Depots are located 25-30 km behind the FEBA near good roads. They are commanded by a logistics officer (assisted by branch depot chiefs) who is subordinate to the division's Chief of the Rear.

A.1.1.2.4.2.3      Motor Transport Battalion Headquarters

The commander of this headquarters oversees the transport and delivery of mobile stocks from division depots and the removal of weapons and equipment requiring repair.

A.1.1.2.4.2.4      Maintenance Battalion Headquarters

The commander of this headquarters oversees the medium repair and overhaul of tracked vehicles, wheeled vehicles, and weapon systems where major components are involved which are not disassembled at echelons below division.

A.1.1.2.4.2.5      Medical Battalion Headquarters

This headquarters provides administrative control for a field hospital operated by the battalion. It is located 15-20 km behind the FEBA.

A.1.1.2.4.3      Regimental Echelon

A.1.1.2.4.3.1      Staff Organization

The rear services staff at regimental level is similar to that at division except that it is organized on a smaller scale. The following officers, under the regimental Chief of the Rear, have maintenance responsibilities in their respective areas:

- 1)      Deputy for technical matters (armored equipment and motor vehicles).
- 2)      Chief of Rocket Troops and Artillery.
- 3)      Regimental Engineer Officer
- 4)      Regimental Signal Officer.
- 5)      Regimental Chemical Officer.

A.1.1.2.4.3.2      Regimental Mobile Depots

These installations are supervised by the regimental Chief of the Rear who functions without depot chiefs. The depots are located 12-15 km from the FEBA and contain ammunition, rations, and fuel. Supplies are kept on vehicles which can be driven to the maneuver battalion supply point.

A.1.1.2.4.3.3      **Motor Transport Company Headquarters**

This headquarters oversees the transport and delivery of mobile stocks from regimental depots to battalion supply points.

A.1.1.2.4.3.4      **Maintenance Company Headquarters**

This headquarters oversees the routine maintenance and medium repair of wheeled and tracked vehicles where major disassembly is not required.

A.1.1.2.4.3.5      **Medical Company Headquarters**

This headquarters provides administrative control for a medical post and dressing station. The location is 6-10 km behind the FEBA.

A.1.1.2.5      **Air Defense Command and Control**

Command and control of air defense weapons is vested in the field commander at each echelon and its exercise is based on the recommendations of the commander's air defense chief. Headquarters of the air defense battalions and regiments function primarily as centers for administration, early warning, and fire direction.

A.1.1.2.5.1      **Army Echelon**

A.1.1.2.5.1.1      **Army Headquarters**

In exercising their command and control capability, the Chief of Air Defense and his staff have the following range of tasks:

- 1)      Prepare the Army air defense plan as an integral part of the Army commander's operation plan.

- 2) Advise the Army commander on the employment of air defense assets.
- 3) Determine allocation of air defense assets to first echelon divisions.
- 4) Assign missions and sectors of fire to the Surface-to-Air (SAM) battalions at Army echelon; monitor their performance and status.
- 5) Coordinate airspace management procedures between air defense units and friendly aircraft.
- 6) Monitor the air warning net and alert subordinate units to intruding enemy aircraft.

Communications

The air defense staff monitors the air warning net and maintains communication with the command elements of the air defense assets using Army headquarters communications links.

A.1.1.2.5.1.2      SA-4 Brigade Headquarters

This headquarters exercises administrative control over its three SAM battalions and associated support units. It also functions as an early warning and fire direction center. Air surveillance radars are usually located in the vicinity of the CP. The SA-4 brigade CP is normally within radio link range of the Army Main CP. Radio or wire communications is maintained with Army Main CP and Army Forward CP via air warning and command nets, and its SA-4 battalions via fire control nets.

A.1.1.2.5.1.3      SA-4 Battalion Headquarters

Each SA-4 battalion headquarters is the location for the intermediate control element between the brigade CP and three SA-4 firing batteries. The brigade's three battalions normally move as independent units but will attempt to maintain contact with each other. An early warning radar is located at each CP. Target tracking information can be passed from brigade to battalion to the firing batteries. The battalion CP is typically found at a location central to its three firing batteries.

Communications

Radio or wire communications are maintained with SA-4 brigade HQ, the other SA-4 battalion HQs, and the firing batteries of the battalion.

A.1.1.2.5.2      Division Echelon

A.1.1.2.5.2.1      Division Headquarters

Division air defense coverage is organized during the planning phase during which the division commander determines the employment of air defense forces to best support the operation plan. This determination is based on the recommendations of the division's Chief of Air Defense. The air defense commander and staff at division HQ have the following range of tasks:

- 1)      Prepare the air defense plan as an integral part of the division operation plan.
- 2)      Determine allocation of air defense assets to first echelon regiments.
- 3)      Determine unit missions and organization compositions for appropriate air defense coverage.

- 4) Monitor the air warning net and alert subordinate units to intruding enemy aircraft.
- 5) During engagements, maintain centralized control and shift missions of units and sectors of fire as necessary.
- 6) Coordinate airspace management procedures between air defense units and friendly fighter aircraft.
- 7) Establish logistical support priorities for subordinate units.

Communications

The air defense staff monitors the air warning net and maintains communications with the SA-6 or SA-8 regimental headquarters using division headquarters communications links.

A.1.1.2.5.2.2      SA-6 (SA-8) Regimental Headquarters

SA-6 (SA-8) regimental HQ is the location of the control element of its five firing batteries. Each battery is a fire unit. The headquarters is usually found within radio link range of the Division Main CP. It functions as an early warning and fire direction center, as well as exercising administrative control. Air surveillance radars are usually located near the SA-6 (SA-8) regimental headquarters.

Communications

The HQ maintains radio or wire communications with Division Main and Forward CPs and the firing batteries while continuously monitoring the air warning net. Target tracking data is passed from the SA-6 (SA-8) headquarters to the batteries.

A.1.1.2.5.3      Regimental Echelon

A.1.1.2.5.3.1      Regimental Headquarters

The SA-9/AAA battery organic to the maneuver regiment may be augmented by division air defense weapons which are attached to the regiment by the division commander. An air defense chief and small staff are present at regimental headquarters. The air defense chief's responsibilities include:

- 1) Advising the regimental commander on the allocation and deployment of the regiment's air defense assets.
- 2) Planning and directing the air defense activities within the regiment.
- 3) Directing the organic (SA-7 SAMs) or attached (ZSU-23-4 platoon) AD assets of subordinate battalions if the situation requires.

The considerations involved in carrying out the above tasks include:

- 1) Commander's guidance.
- 2) Mission assigned to the regiment.
- 3) Tactical formation chosen by the commander.
- 4) Considerations of terrain, fields of fire and observation.

#### Communications

Radio communications are maintained with the headquarters of the regimental air defense (SA-9/AAA) battery, other AD batteries (if any) supporting the regiment, and AD platoons supporting subordinate maneuver battalions.

A.1.1.2.5.3.2      SA-9/AAA Battery Headquarters

Battery HQ serves as the administrative control element for the SAM SA-9 platoon and the AAA ZSU-23-4 platoon. The basic mission of the battery is to provide low altitude air defense coverage for the regiment and its combat support elements. Battery commander coordinates procedures and coverage between the subordinate AD units. The command post is normally located near the main CP of the maneuver regiment and contains a small staff. The commander may also utilize an APC as a mobile CP.

Communications

The battery CP communicates by radio with the air defense chief at regimental headquarters and the subordinate AD platoon commanders, while also monitoring the division's air warning net.

A.1.2            IDENTIFICATION AND DESCRIPTION OF ELEMENTS

A.1.2.1           Threat

Soviet military doctrine lays great emphasis on the offensive as the primary means of warfare. This implies the seizure of the initiative, the ability to cover large distances at great speed and the achievement of maximum effect by surprise, concentration of firepower and maneuver, exploiting any breakthroughs to penetrate deep in the rear of the enemy's position. The way to victory lies only in the offensive. The Soviet ground forces are, therefore, organized, trained and equipped to fight one type of war (offensive war) regardless of who starts the war.

Although a future ground war involving U.S. and Soviet forces could be fought in several theaters such as the Middle East or Korea, the greatest threat is in Central Europe where the preponderance of forces are. The Soviets already have in place 10 tank and 10 motorized rifle divisions in their Group of Soviet Forces Germany (GSFG). They have two

additional tank divisions in Poland (Northern Group of Forces-NGF) as well as five tank and motorized rifle divisions in Czechoslovakia. Poland, East Germany and Czechoslovakia also maintain standing armies with organizations and equipment similar to those of the Soviets. It is estimated that at least 50 divisions (nearly half of which are tank divisions) are essentially fully equipped and combat ready as part of their normal peacetime status.

A surprise attack, utilizing 50 Warsaw Pact divisions would give the Soviets a decisive advantage over NATO forces. Such an attack would probably utilize a three Front force opposite NATO, consisting of Soviet groups of forces in East Germany, Poland, and Czechoslovakia as well as the national forces of these countries. Second echelon Fronts would be units of the Baltic, Belorussian and Carpathian military districts of the USSR.

The following sections outline the organization and equipment used by the Soviets to fight an operational level ground war and give a brief summary of how each of the ground force echelons is integrated into the overall concept of operations for such a war.

#### A.1.2.1.1

#### Concept of Operations

The Soviets consider the offensive to be the chief and decisive form of military operation. Only by mounting an offensive operation is it possible to defeat and destroy the enemy's field forces, capture important territory, and ensure victory. The Soviets conduct a large scale offensive with several Fronts \* over one or more strategic axes or across a considerable portion of the territory of a continent. The goals of such a large strategic operation usually include:

\* A Front consists of a group of armies equivalent to a Western Army group

- 1) Defeat of a large enemy field force (armies or Army groups).
- 2) Capture of vital regions or installations.

A Front may conduct a strategic operation alone or in concert with other Fronts. An operational Front is about 200 Km wide and up to 250 Km deep including rear area installations. A large Front might have five to seven armies with up to 30 combat divisions.

Three or four first echelon armies are typically deployed across the Front to a depth of 100 Km or more behind the forward edge of the battle area (FEBA). Second echelon armies may be located in assembly areas or along routes of advance about 125 to 150 Km behind the line of contact. There are two designated types of armies. These are the combined arms Army (CAA) and the tank Army (TA).

The CAA is normally employed as part of a Front although it is capable of independent operation. Generally, the CAA attacks in two echelons. The first echelon, whose mission is to create large gaps in the FEBA, usually consists of two or more motorized rifle divisions (MRDs). A tank division may be employed in first echelon, depending on terrain and circumstances. One or two second echelon divisions are dispersed 20 to 30 Km behind the rear boundaries of the first echelon.

A tank Army (TA) may contain three or four tank divisions (TDs) and one motorized rifle division (MRD). As part of a Front, the TA is designed to exploit breakthroughs and seize objectives deep in enemy rear areas. The tank Army usually attacks in two echelons, with the second echelon divisions following about 20 to 30 Km to the rear of the leading divisions.

The TA or CAA making the main effort may have an attack frontage as narrow as 50 Km with a division breakthrough zone 10-15 Km wide.

An Army conducting a secondary attack on the flank of the breakthrough Army can have an assigned frontage of up to 90-100 Km. (See Figure A-12.)

Second echelon armies and divisions are used to exploit breakthroughs, widen gaps created by first echelon formations, destroy bypassed enemy forces and repel counterattacks.

The motorized rifle division (MRD) and tank division (TD) are employed as part of the CAA and/or TA, and normally attack in two echelons. The first echelon of an MRD typically consists of two motorized rifle regiments (MDRs), reinforced with tanks and combat support units, while the second echelon consists of the third MRR and the tank regiment. The first echelon of a TD may consist of two tank regiments (TRs) reinforced with motorized rifle and combat support elements. The second echelon consists of the third tank regiment and/or the motorized rifle regiment.

A TD or MRD may be assigned a frontage of 10 to 15 Km in the first echelon of a main effort, with the frontage narrowing to 5 to 8 Km in the breakthrough zone. Divisions conducting holding attacks on the flanks of the main effort may be deployed along a frontage of up to 35 Km. The depth of a first echelon division tactical area is 25 to 25 Km. Whereas the MRD is usually committed to forcing an initial breakthrough, the TD has the more mobile mission of exploiting gaps made by the MRD and creating shock and disruption in the enemy rear areas.

Prior to combat, tank and infantry units at regimental level and below will organize into combat teams tailored to perform specific tasks. These teams will normally be supported by artillery, air defense, antitank, engineer and other combat elements.

The motorized rifle regiment (MRR) and the tank regiment (TR) are the immediate subordinate tactical units of the division. An MRR is normally reinforced by tanks (or by motorized infantry if the reinforced unit is a tank regiment). If the parent division is making the Army's main thrust,

## THREAT MECHANIZED/ARMOR-HEAVY OFFENSIVE OPERATIONS

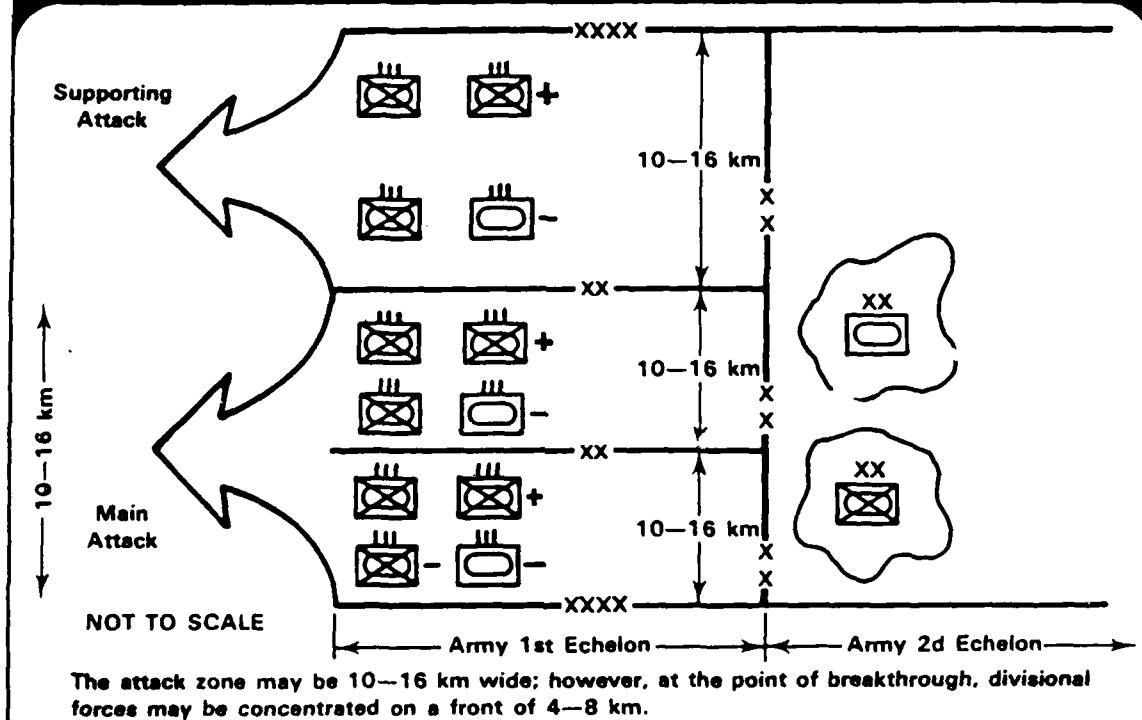


Figure A-12. Threat Mechanized/Armor-Heavy  
Offensive Operations

a first echelon regiment may have a frontage of 5 to 8 Km, with a breakthrough zone 2 to 4 Km wide within this frontage. If the division is conducting a holding attack the regiment may be assigned a frontage of 10 to 15 Km. The depths of a deployed regiment extends 12 to 15 Km rearward of the FEBA. Attacking within this formation are two reinforced first echelon battalions, followed at a 3 to 6 Km interval by the remaining battalions.

Motorized rifle battalions (MRBs) and tank battalions (TKBs) are the maneuver elements of the parent regiments. The mission of the TKB or MRB in the first echelon is to break through enemy forward positions and create a gap that can be exploited by the second echelon battalion.

As described in 71-101,

"Threat doctrine identifies motorized rifle units as best suited for the conduct of defensive operations. Armored units defend in the first echelon only when necessary and then only temporarily. A defending first-echelon tank unit is replaced by a motorized rifle division at the earliest possible time.

The Threat conducts either a hasty or deliberate defense. The hasty defense is conducted for short durations, and it is the most common form of defense. This form of the defense provides for rapid transition to the offense or to a well-prepared deliberate defense. The hasty defense is normally employed by units on the move that are forced to stop in place.

The deliberate defense is used when the advance is halted for more than a few hours. When a deliberate defense is conducted, the Threat normally establishes a security zone and defensive belts heavily supported by artillery, air defense systems, antitank weapons, engineer units, and

aviation units. Each of the defensive belts contains a series of well-fortified strongpoints located to cover the most likely avenues of approach. Alternate positions are prepared along other less likely avenues of approach. Some armor units are assigned reserve missions for conducting the counterattack." (See Figure A-13.)

#### A.1.2.1.2

#### Force Organization

There is no fixed Front organization. The number of armies and divisions within a Front vary widely. A single Soviet Front in Central Europe would be attacking three or four NATO corps along a 200-250 Km defense line. One or two Soviet armies of this Front could be deployed across a frontage that a U.S. corps might be expected to defend. For this reason, the force organization presented in this section begins at Army rather than Front level.

The Army is the highest peacetime combined arms formation. It has a permanently constituted staff and an assigned complement of non-divisional combat support and combat service support elements. These can be supplemented with Front assets such as helicopter regiments or additional artillery. The number of divisions within an Army can vary, usually from three to seven. (See Figure A-14.)

The division is the highest tactical level where a fixed organization is found. It has organic fire support consisting of cannon artillery, mortars, missiles and rocket launchers. This can be supplemented by additional fire power allocated to the divisions by Front and Army headquarters. The tank division, in comparison to the motorized rifle division, is light on infantry and heavy on tanks (325 tanks for the TD compared with 266 tanks for the MRD). This organization is consistent with the tank division's more mobile mission of exploitation and pursuit. (See Figures A-15 through A-18.)

## TANK MECHANIZED/ARMOR-HEAVY DEFENSIVE OPERATIONS

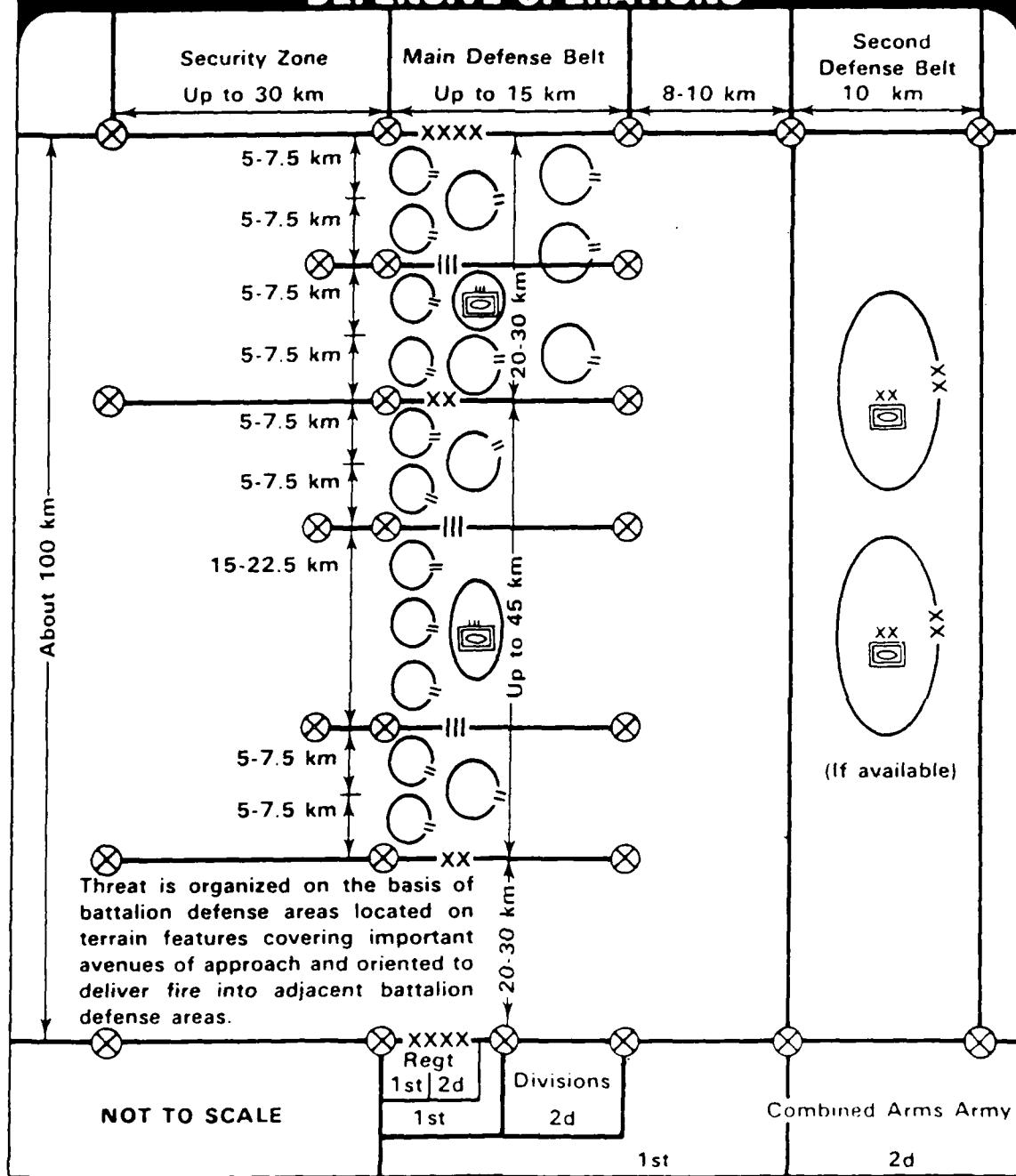


Figure A-13. Tank Mechanized/Armor-Heavy  
Defensive Operations

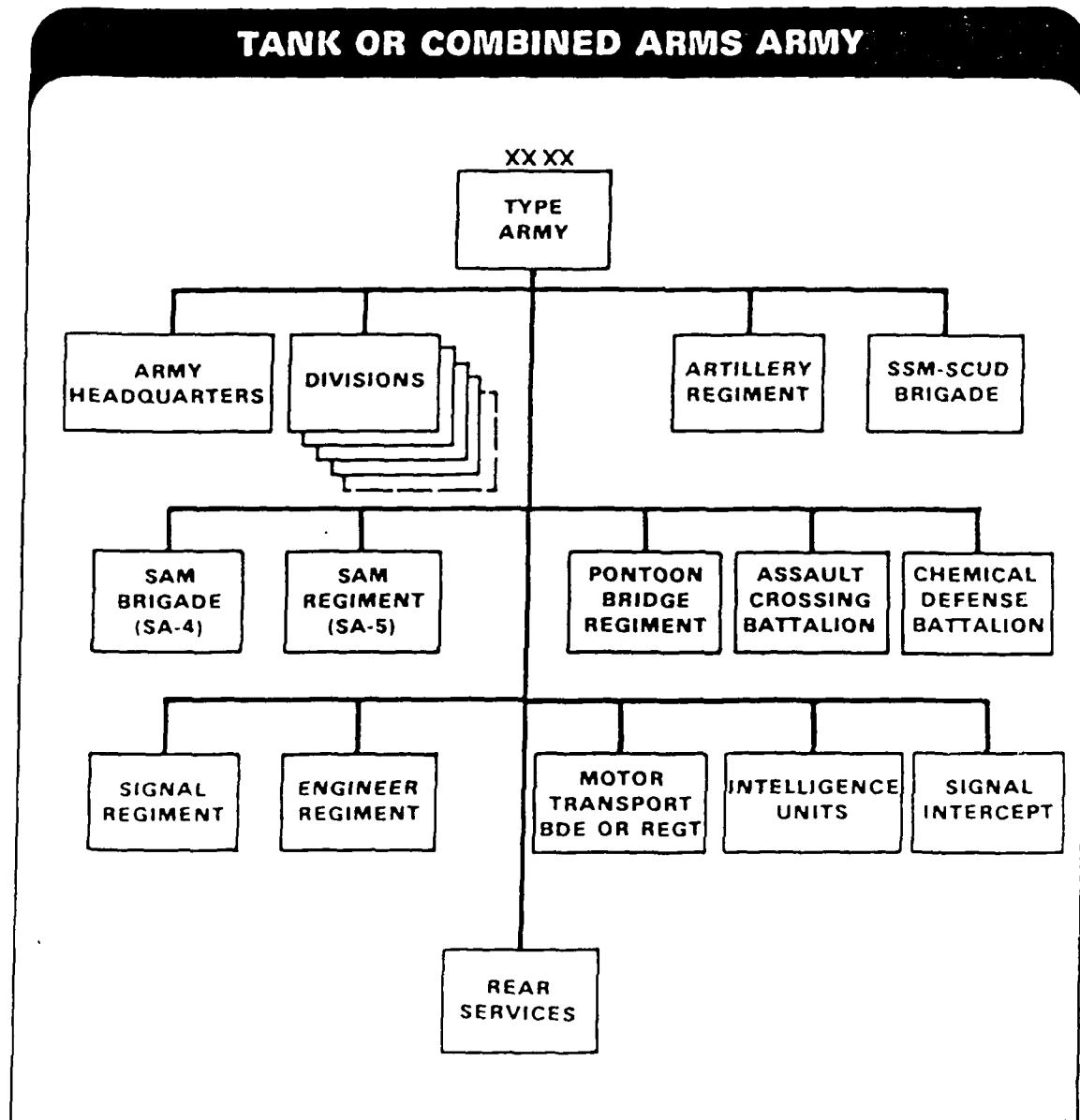


Figure A-14. Tank or Combined Arms Army

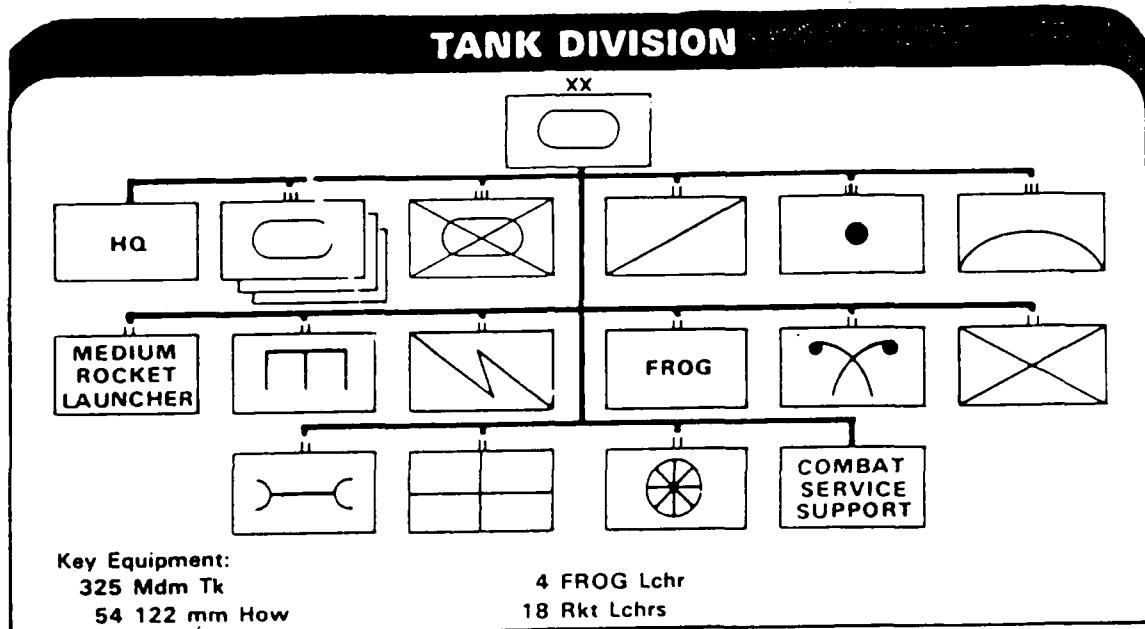


Figure A-15. Tank Division

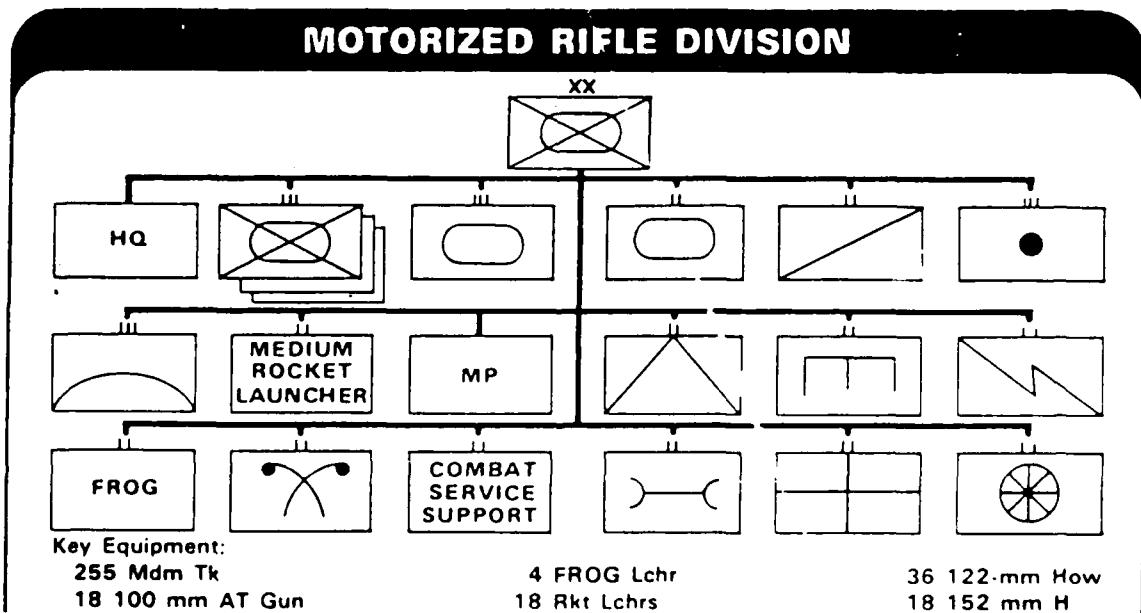


Figure A-16. Motorized Rifle Division

## INFANTRY-HEAVY THREAT ARMORED DIVISION

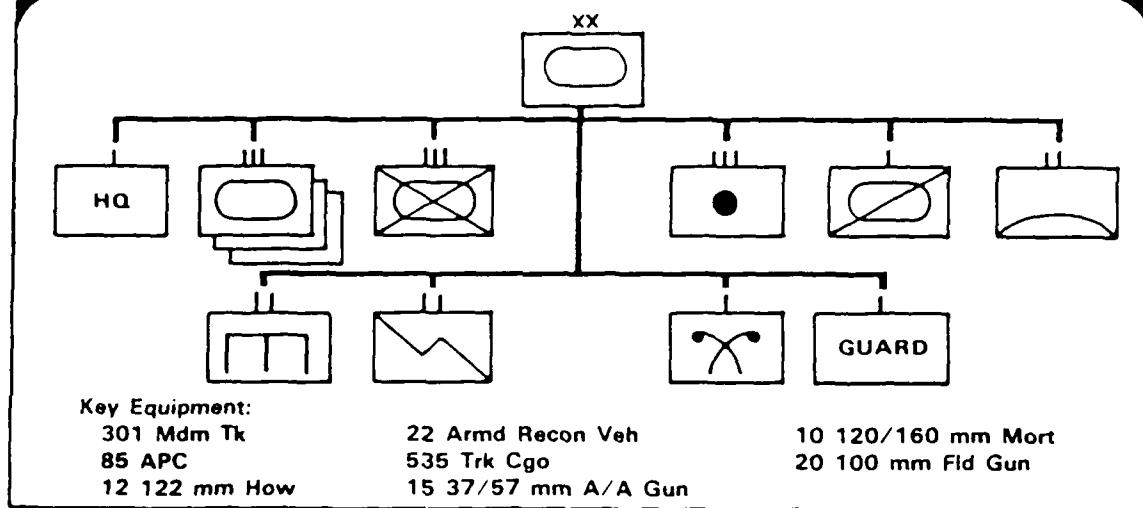


Figure A-17. Infantry-Heavy Threat Division

## THREAT INFANTRY DIVISION

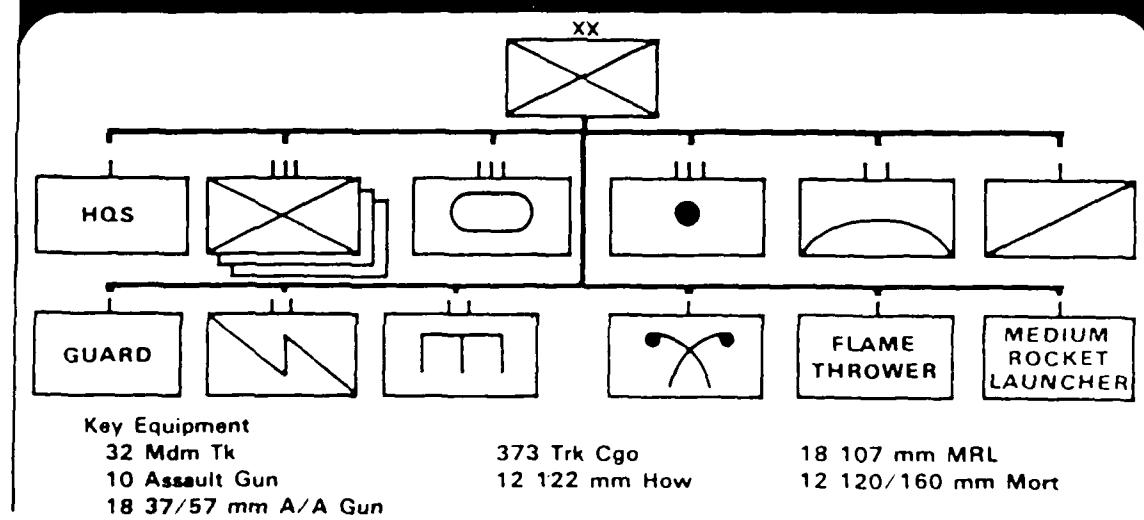


Figure A-18. Threat Infantry Division

The motorized rifle regiment (MRR) is fully mobile, equipped with sufficient motorized transport to carry all personnel of the regiment and their equipment. The regiment contains three motorized rifle battalions and a tank battalion. Organic fire support is provided by a battalion of 122 mm howitzers and mortar and antitank elements. The tank regiment (TR) has three tank battalions and a motorized rifle company. Combat support units in a TR are generally similar to the MRR, but the regiment is without organic artillery.

The motorized rifle battalion (MRB) contains three motorized rifle companies and possesses organic fire support in the form of mortars, antitank missiles, and recoilless guns. Combat troops are transported in either BMP or BTR-60 infantry vehicles. There is only one type (BMP or BTR-60) in any given regiment. Elite MRB troops can be airlifted by helicopter and landed behind enemy lines to seize key bridges and terrain, or to destroy C<sup>3</sup> centers, nuclear storage sites, etc.

The tank battalion (TKB) contains three tank companies (10 tanks per company) and may be reinforced (from regimental assets) by motorized infantry, artillery, engineers and air defense units.

A.1.2.1.2.1      Army

A.1.2.1.2.1.1    Maneuver

- 1) Headquarters and Headquarters Company
- 2) Tank Division(s) \*
- 3) Motorized Rifle Division(s) \*

\* A tank Army may have 3 or 4 tank divisions and 1 motorized rifle division. A combined arms Army may have 2-4 motorized rifle divisions and 1 tank division. The number and type of divisions in an Army may be tailored to meet specific needs, depending on mission and terrain.

A.1.2.1.2.1.2      Combat Support

- 1) Helicopter Regiment \*
- 2) Artillery Regiment
- 3) SCUD Surface-to-Surface Missile Brigade
- 4) SA-4 Surface-to-Air Missile Brigade
- 5) SA-6 Surface-to-Air Missile Regiment
- 6) Engineer Brigade
- 7) Pontoon Bridge Regiment
- 8) River Crossing Battalion
- 9) Signal Regiment
- 10) Chemical Defense Battalion
- 11) Air Defense Early Warning Battalion
- 12) Radioelectronic Combat Battalion
- 13) Signal Intercept Battalion
- 14) Combat Intelligence Battalion

A.1.2.1.2.1.3      Combat Service Support

- 1) Motor Transport Regiment
- 2) Maintenance Battalion
- 3) Medical Battalion

A.1.2.1.2.2      Division

\* Forward area armies may have helicopter regiments but these are not organic to the Army organization.

A.1.2.1.2.2.1      Maneuver

- 1) Headquarters and Headquarters Company
- 2) Tank Regiments \*
- 3) Motorized Rifle Regiments \*
- 4) Independent Tank Battalion \*\*
- 5) Antitank Battalion \*\*

A.1.2.1.2.2.2      Combat Support

- 1) Artillery Regiment
- 2) Surface-to-Air Missile Regiment (SA-6 or SA-8)
- 3) Multiple Rocket Launcher Battalion
- 4) Engineer Battalion
- 5) Signal Battalion
- 6) Reconnaissance Battalion
- 7) Chemical Defense Battalion

A.1.2.1.2.2.3      Combat Service Support

- 1) Motor Transport Battalion
- 2) Maintenance Battalion
- 3) Medical Battalion
- 4) Traffic Control Company

\* A Tank Division contains 3 tank regiments and 1 BMP-equipped motorized rifle regiment. A motorized rifle division may contain 1 BMP-equipped and 2 BTR-60-equipped motorized rifle regiments, along with 1 tank regiment.

\*\* Not present in a tank division.

A.1.2.1.2.3      Regiment

A.1.2.1.2.3.1    Maneuver

- 1) Headquarters and Headquarters Company
- 2) Tank Battalions \*
- 3) Motorized Rifle Battalions \*

A.1.2.1.2.3.2    Combat Support

- 1) Howitzer Battalion \*\*
- 2) Antitank Battery \*\*
- 3) Air Defense Battery
- 4) Reconnaissance Company
- 5) Engineer Company
- 6) Signal Company
- 7) Chemical Defense Company

A.1.2.1.2.3.3    Combat Service Support

- 1) Motor Transport Company
- 2) Maintenance Company
- 3) Medical Company
- 4) Supply and Service Platoon
- 5) Traffic Control Platoon

\* A tank regiment typically contains 3 tank battalions and a motorized rifle company. A motorized rifle regiment contains 3 motorized rifle battalions and a tank battalion.

\*\* Not present in the T.O.E. of a tank regiment.

A.1.2.1.2.4.      Battalion

A.1.2.1.2.4.1      Tank Battalion \*

- 1) Headquarters
- 2) Tank Companies [3]
- 3) Supply and Maintenance Platoon
- 4) Medical Section.

A.1.2.1.2.4.2      Motorized Rifle Battalion

- 1) Headquarters
- 2) Motorized Rifle Companies [3]
- 3) Mortar Battery
- 4) Antitank Platoon
- 5) Communications Platoon
- 6) Supply and Maintenance Platoon
- 7) Medical Section

A.1.2.1.2.4.3      Antitank Battalion

- 1) Headquarters
- 2) Antitank Batteries [3]
- 3) Service Battery

A.1.2.1.2.5      Artillery Organization

A.1.2.1.2.5.1      Army Echelon

\* An independent tank battalion of a motorized rifle division will contain 5 tank companies.

A.1.2.1.2.5.1.1 Artillery Regiment

- 1) Headquarters Battery
- 2) 130mm M-46 Field Gun Battalions [2]
- 3) 152mm D-20 Gun-Howitzer Battalion(s) [1-2]
- 4) Target Acquisition Battery
- 5) Service Battery

A.1.2.1.2.5.2 Division Echelon

A.1.2.1.2.5.2.1 Artillery Regiment

- 1) Headquarters Battery
- 2) 122mm M-1974 SP Howitzer Battalion \*
- 3) 122mm D-30 Howitzer Battalion \*
- 4) 152mm M-1973 SP Gun-Howitzer Battalion
- 5) Target Acquisition Battery
- 6) Service Battery

A.1.2.1.2.5.2.2 Multiple Rocket Launcher Battalion

- 1) Headquarters Battery
- 2) 122mm BM-21 Firing Batteries [3]
- 3) Service Platoon

\* Some artillery regiments of tank and motorized rifle divisions may be equipped entirely with self propelled artillery. Other divisions may still contain one or more battalions of 122mm D-30 towed howitzers. There is no uniform equipment at this time.

A.1.2.1.2.5.3      Motorized Rifle Regiment Echelon

A.1.2.1.2.5.3.1    Artillery Battalion

- 1) Headquarters Battery
- 2) 122mm M-1974 SP Howitzer Batteries [3] \*  
or 122mm D-30 Howitzer Batteries [3] \*\*
- 3) Service Platoon

A.1.2.1.2.5.4    Type Heavy Artillery Brigade \*\*\*

- 1) Headquarters Battery
- 2) 180mm S-23 Field Gun Battalions [2]
- 3) 240mm M53 Heavy Mortar Battalion
- 4) Target Acquisition Battery
- 5) Service Battery

A.1.2.1.2.6      Battlefield Missile Organization

A.1.2.1.2.6.1    SCUD Brigade (Army Echelon)

- 1) Headquarters Battery
- 2) SCUD Launch Battalions [3]
- 3) Engineer Company

\* Present in BMP-equipped motorized rifle regiment.

\*\* Present in many BTR-60 equipped motorized rifle regiments.

\*\*\* Not part of regular artillery organization. A dozen heavy artillery brigades could be deployed forward from the USSR to give selected armies and Fronts at least one brigade each. Artillery types and combinations other than those listed are possible.

- 4) Signal Company
- 5) Technical Support/Service Battery
- 6) Meteorological Battery

A.1.2.1.2.6.2      FROG Battalion (Division Echelon)

- 1) Headquarters Battery
- 2) FROG Firing Batteries [2]
- 3) Service Platoon

A.1.2.1.2.7      Air Defense Organization

A.1.2.1.2.7.1      Army Echelon

A.1.2.1.2.7.1.1      SA-4 SAM Brigade

- 1) Headquarters and Service Battery
- 2) SA-4 SAM Battalions [3]
- 3) Technical Support Battalion

A.1.2.1.2.7.1.1.1      SA-4 SAM Battalion

- 1) Headquarters and Service Battery
- 2) SA-4 SAM Batteries [3]

A.1.2.1.2.7.1.2      SA-6 SAM Regiment

- 1) Headquarters and Service Battery
- 2) SA-6 SAM Batteries [5]
- 3) Technical Support Battery

A.1.2.1.2.7.2      Division Echelon

A.1.2.1.2.7.2.1    SA-6 SAM Regiment \*

- 1) Headquarters and Service Battery
- 2) SA-6 SAM Batteries [5]
- 3) Technical Support Battery

A.1.2.1.2.7.2.2    SA-8 SAM Regiment \*

- 1) Headquarters and Service Battery
- 2) SA-8 SAM Batteries [5]
- 3) Technical Support Battery

A.1.2.1.2.7.2.3    57mm S-60 Regiment \*\*

- 1) Headquarters and Service Battery
- 2) 57mm S-60 Batteries [4]

A.1.2.1.2.7.3      Regimental Echelon

A.1.2.1.2.7.3.1    AA/Missile Battery

- 1) Headquarters
- 2) ZSU-23-4 Platoon
- 3) SA-9 Platoon
- 4) Maintenance and Support Platoon

\* SA-6 and SA-8 SAM Regiments are not both present in the same tank or motorized rifle division.

\*\* These regiments are being replaced by SA-6 and SA-8 SAM regiments.

A.1.2.1.2.8      Assault Helicopter Regiment \*

- 1) Headquarters
- 2) Mi-8 HIP Transport Squadrons [2]
- 3) Mi-24 HIND Assault Squadrons [3]

A.1.2.1.2.9      Engineer Organization

A.1.2.1.2.9.1      Engineer Brigade (Army Echelon)

- 1) Headquarters and Service Company
- 2) Engineer Battalions [3]
- 3) Construction Battalion

A.1.2.1.2.9.2      Engineer Battalion (Division Echelon)

- 1) Headquarters and Service Company
- 2) Sapper Company
- 3) Road Company
- 4) Pontoon Bridge Company
- 5) Assault Crossing Company

A.1.2.1.2.10      Signal Organization

A.1.2.1.2.10.1      Signal Regiment (Army Echelon)

- 1) Headquarters and Service Company
- 2) Radio Battalion
- 3) Wire Battalion
- 4) Radio Relay Battalion

\* Helicopter regiments may be assigned to an Army headquarters by the Front commander. Each regiment contains 50 to 60 helicopters.

A.1.2.1.2.10.2      Signal Battalion (Division Echelon)

- 1) Headquarters and Service Company
- 2) Command Post Company
- 3) Radio Company
- 4) Wire Company

A.1.2.1.2.11      Chemical Defense Organization

A.1.2.1.2.11.1      Chemical Defense Battalion (Army Echelon)

- 1) Headquarters and Service Company
- 2) Chemical Defense Companies [3]
- 3) Chemical Reconnaissance Company

A.1.2.1.2.11.2      Chemical Defense Battalion (Division Echelon)

- 1) Headquarters and Service Company
- 2) Equipment Decontamination Company
- 3) Personnel Decontamination Companies [2]

A.1.2.1.2.12      Intelligence/Electronic Warfare Organization

A.1.2.1.2.12.1      Combat Intelligence Battalion (Army Echelon)

- 1) Headquarters and Service Company
- 2) Command Post Support Element
- 3) Collection Company
- 4) Long Range Reconnaissance Company

A.1.2.1.2.12.2      Signal Intercept Battalion (Army Echelon)

- 1) Headquarters and Service Company
- 2) Radio Intercept Company
- 3) Radio Direction Finding Company
- 4) Radar Intercept and DF Company

A.1.2.1.2.12.3      Radioelectronic Combat Battalion (Army Echelon)

- 1) Headquarters and Service Company
- 2) Light Tank (PT-76) Company
- 3) Scout Car (BRDM/BRDM-2) Company
- 4) Long Range Reconnaissance Company
- 5) Signal Intercept Company

A.1.2.1.2.13      Motor Transport Regiment (Army Echelon)

- 1) Headquarters and Service Company
- 2) Motor Transport Battalion  
(Tank Transport Battalion) \*
- 3) Maintenance Company

A.1.2.1.3      Force Components

A.1.2.1.3.1      Armored Vehicles

A.1.2.1.3.1.1      Tank Characteristics

\* A Tank Transport Battalion may be attached when the situation dictates.

A.1.2.1.3.1.1.1    Main Armament (mm)

- 1)    Ammunition
- 2)    Basic Load (rd)
- 3)    Rate of Fire (rpm)
- 4)    Maximum Effective Range (Km)

A.1.2.1.3.1.1.2    Secondary Armament (mm)

- 1)    Basic Load (rd)
- 2)    Rate of Fire (rpm)
- 3)    Maximum Effective Range (Km)

A.1.2.1.3.1.1.3    Vehicle

- 1)    Height (mm)
- 2)    Width (mm)
- 3)    Length (mm)
- 4)    Armor (mm)
- 5)    Combat Weight (t)
- 6)    Cruising Range (Km)
- 7)    Speed (Km/hr)
- 8)    Crew

A.1.2.1.3.1.1.4    Examples

- 1)    T-80 Main Battle Tank
- 2)    T-72 Main Battle Tank
- 3)    PT-76 Light Tank

A.1.2.1.3.1.2      Infantry Fighting Vehicle Characteristics

A.1.2.1.3.1.2.1    Main Armament (mm)

- 1) Ammunition
- 2) Basic Load (rd)
- 3) Rate of Fire (rpm)
- 4) Maximum Effective Range (Km)

A.1.2.1.3.1.2.2    Secondary Armament (mm)

- 1) Basic Load (rd)
- 2) Rate of Fire (rpm)
- 3) Maximum Effective Range (Km)

A.1.2.1.3.1.2.3    Vehicle

- 1) Height (mm)
- 2) Width (mm)
- 3) Length (mm)
- 4) Armor (mm)
- 5) Combat Weight (t)
- 6) Cruising Range (Km)
- 7) Speed (Km/hr)
- 8) Crew
- 9) Passengers

A.1.2.1.3.1.2.4    Examples

- 1) BMP Infantry Fighting Vehicle

A.1.2.1.3.1.3      Armored Personnel Carrier Characteristics

A.1.2.1.3.1.3.1 Main Armament (mm)

- 1) Ammunition
- 2) Basic Load (rd)
- 3) Rate of Fire (rpm)
- 4) Maximum Effective Range (Km)

A.1.2.1.3.1.3.2 Secondary Armament (mm)

- 1) Basic Load (rd)
- 2) Rate of Fire (rpm)
- 3) Maximum Effective Range (Km)

A.1.2.1.3.1.3.3 Vehicle

- 1) Height (mm)
- 2) Width (mm)
- 3) Length (mm)
- 4) Armor (mm)
- 5) Combat Weight (t)
- 6) Cruising Range (Km)
- 7) Speed (Km/hr)
- 8) Crew
- 9) Passengers

A.1.2.1.3.1.3.4 Examples

- 1) BTR-60PB Armored Personnel Carrier
- 2) MT-LB Multi-Purpose Tracked Vehicle
- 3) ACRV-2 Armored Command Vehicle
- 4) BRDM-1 Reconnaissance Vehicle
- 5) BRDM-2 Reconnaissance Vehicle

A.1.2.1.3.2      Field Artillery and Mortars

A.1.2.1.3.2.1      Howitzer Characteristics

- 1) Ammunition
- 2) Basic Load (rd)
- 3) Rate of Fire (rpm)
- 4) Maximum Effective Range (Km)
- 5) CEP (m)
- 6) Towed/SP
- 7) Crew

A.1.2.1.3.2.1.1      Examples

- 1) 122mm D-30 Howitzer
- 2) 122mm M-1974 SP Howitzer
- 3) 152 mm D-20 Gun-Howitzer
- 4) 152mm M-1973 SP Gun-Howitzer

A.1.2.1.3.2.2      Field Gun Characteristics

- 1) Ammunition
- 2) Basic Load (rd)
- 3) Rate of Fire (rpm)
- 4) Maximum Effective Range (Km)
- 5) CEP (m)
- 6) Towed
- 7) Crew

A.1.2.1.3.2.2.1      Examples

- 1) 122mm D-74 Field Gun
- 2) 130mm M46 Field Gun
- 3) 180mm S-23 Field Gun

A.1.2.1.3.2.3      Mortar Characteristics

- 1) Ammunition
- 2) Basic Load (rd)
- 3) Rate of Fire (rpm)
- 4) Maximum Effective Range (Km)
- 5) CEP (m)
- 6) Mobility
- 7) Towed
- 8) Crew

A.1.2.1.3.2.3.1    Examples

- 1) 120mm M-1943 Mortar
- 2) 160mm M-1953 Heavy Mortar
- 3) 240mm M-1953 Heavy Mortar

A.1.2.1.3.2.4      Multiple Rocket Launcher Characteristics

- 1) Caliber (mm)
- 2) Warhead Weight (kg)
- 3) Number of Tubes
- 4) Range (Km)
- 5) Carrier Vehicle
- 6) Cruising Range (Km)
- 7) Speed (Km/hr)
- 8) Crew

A.1.2.1.3.2.5    Examples

- 1) 122mm BM-21 Rocket Launcher

A.1.2.1.3.3      Missile Artillery

A.1.2.1.3.3.1    Missile Characteristics

- 1) Diameter (mm)
- 2) Warhead
- 3) Warhead Weight (kg)
- 4) Guidance
- 5) Maximum Range (Km)
- 6) CEP
- 7) Carrier Vehicle
- 8) Cruising Range (Km)
- 9) Speed (Km/hr)
- 10) Crew

A.1.2.1.3.3.1.1    Examples

- 1) SS-1 SCUD-B
- 2) FROG-7

A.1.2.1.3.4      Antitank Weapons

A.1.2.1.3.4.1    Antitank Missile Characteristics

- 1) Ammunition
- 2) Basic Load (rd)
- 3) Guidance
- 4) Minimum Range (m)
- 5) Maximum Range (m)
- 6) Average Velocity (m/s)
- 7) Armor Penetration at 1000m and 0° Obliquity (mm)
- 8) Launch Vehicle Type
- 9) Launch Crew

A.1.2.1.3.4.1.1    Examples

- 1) AT-2 Swatter Missile
- 2) AT-3 Sagger Missile
- 3) AT-4 Spigot Missile
- 4) AT-5 Spandrel Missile
- 5) AT-6 Spiral Missile

A.1.2.1.3.4.2    Antitank Gun Characteristics

- 1) Ammunition
- 2) Basic Load (rd)
- 3) Rate of Fire
- 4) Maximum Effective Range (Km)
- 5) Armor Penetration at 500m and 0° Obliquity (mm)
- 6) Towed
- 7) Crew

A.1.2.1.3.4.2.1    Examples

- 1) T-12 100mm Antitank Gun

A.1.2.1.3.5    Air Defense Weapons

A.1.2.1.3.5.1    Air Defense Missile Characteristics

- 1) Guidance Type
- 2) Maximum Range (Km)
- 3) Maximum Altitude (Km)
- 4) Minimum Altitude (Km)
- 5) Velocity (mach)
- 6) Missiles per Launcher

- 7) Launchers per Site
- 8) Fire Control Radar
- 9) Mobility

A.1.2.1.3.5.1.1 Examples

- 1) SA-4 GANEF Missile
- 2) SA-6 GAINFUL Missile
- 3) SA-8 GECKO Missile
- 4) SA-9 GASKIN Missile
- 5) SA-11 (?) Missile

A.1.2.1.3.5.2 Air Defense Gun Characteristics

- 1) Ammunition
- 2) Basic Load (rd)
- 3) Number of Tubes
- 4) Rate of Fire
- 5) Effective Slant Range (Km)
- 6) Elevation (deg)
- 7) Fire Control Radar
- 8) Mobility

A.1.2.1.3.5.2.1 Examples

- 1) S-60 57mm AA Gun
- 2) ZSU-23-4 AA Gun (SP)

A.1.2.1.3.6      Aircraft

A.1.2.1.3.6.1      Helicopter Characteristics

- 1) Type
- 2) Combat Radius (Km)
- 3) Maximum Speed (kph)
- 4) Payload (kg)
- 5) Armament
- 6) Personnel

A.1.2.1.3.6.1.1      Examples

- 1) Mi-2 Hoplite Light Helicopter
- 2) Mi-4 HOUND Medium Helicopter
- 3) Mi-6 HOOK Heavy Helicopter
- 4) Mi-8 HIP Medium Helicopter
- 5) Mi-24 HIND Assault Helicopter

A.1.2.1.4      Tactical Communications

A.1.2.1.4.1      Types

A.1.2.1.4.1.1      Wire

- 1) Field Telephones (all echelons down to company)
- 2) Teleprinter (regiments and above)

A.1.2.1.4.1.2      Visual (Used by small unit commanders)

- 1) Colored/Illuminating Flares
- 2) Colored Smoke
- 3) Tracer Rounds

A.1.2.1.4.1.3      Radio Relay (division and above)

A.1.2.1.4.1.3.1    R-400

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.3.2    R-401/R-403

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.3.3    R-404

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.3.4    R-405

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4      Radio (all echelons)

A.1.2.1.4.1.4.1      R-102M

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4.2      R-103M

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4.3      R-104M

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4.4      R-105D/105M

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4.5    R-107

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4.6    R-108D/108M

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4.7    R-109D/109M

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4.8    R-112

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4.9    R-113

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.1.4.10    R-114D/114M

- 1) Power Source/Output (w)
- 2) Frequency (MHz)
- 3) Range (Km)
- 4) Tactical Echelon
- 5) Use

A.1.2.1.4.2        Nets

A.1.2.1.4.2.1      Front-Army

- 1) Distance - 30 Km
- 2) Radios

A.1.2.1.4.2.2      Army-Army

- 1) Distance - 40 Km
- 2) Radios

A.1.2.1.4.2.3      Army-Division

- 1) Distance - 20 Km
- 2) Radios

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DEFENSE INFORMATION SYSTEMS PROGRAM AUTOMATED CORDIVEM

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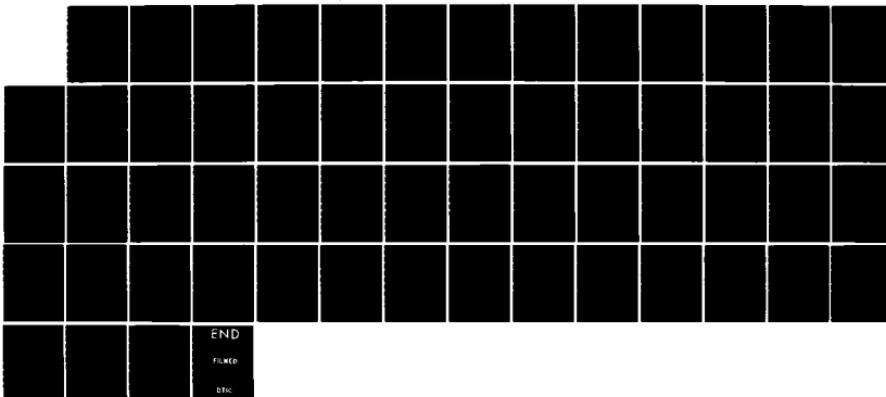
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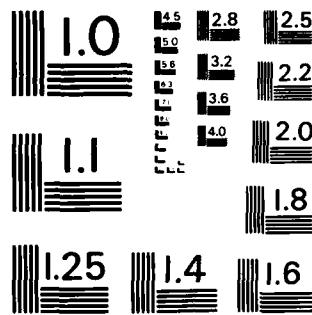
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A.1.2.1.4.2.4      Division-Division

- 1)   Distance - 15 Km
- 2)   Radios

A.1.2.1.4.2.5      Division-Regiment

- 1)   Distance - 8 Km
- 2)   Radios

A.1.2.1.4.2.6      Regiment-Regiment

- 1)   Distance - 9 Km
- 2)   Radios

A.1.2.1.4.2.7      Regiment-Battalion

- 1)   Distance - 6 Km
- 2)   Radios

A.1.2.1.4.2.8      Battalion-Battalion

- 1)   Distance - 6 Km
- 2)   Radios

A.1.2.1.4.2.9      Battalion-Company

- 1)   Distance - 5 Km
- 2)   Radios

A.1.2.1.4.2.10      Company-Company

- 1)   Distance - 3 Km
- 2)   Radios

A.1.2.1.4.2.11    Company-Platoon

- 1)   Distance - .5 Km
- 2)   Radios - R-105, 107, 108, 123, 126

A.1.2.1.4.2.12    Skip Echelon

A.1.2.1.4.2.12.1    Front-Division

- 1)   Distance - 40 Km
- 2)   Radios

A.1.2.1.4.2.12.2    Army-Regiment

- 1)   Distance - 25 Km
- 2)   Radios

A.1.2.1.4.2.12.3    Division-Battalion

- 1)   Distance - 15 Km
- 2)   Radios

A.1.2.1.4.2.12.4    Regiment-Company

- 1)   Distance - 10 Km
- 2)   Radios

A.1.2.1.5    Radar Emitters

A.1.2.1.5.1    Target Acquisition (Air Defense)

A.1.2.1.5.1.1      Long Track

- 1)    Weapon System - SA-4, SA-6
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Range (Km)
- 5)    Deployment Mode

A.1.2.1.5.1.2      Squat Eye

- 1)    Weapon System - General Early Warning
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Range (Km)
- 5)    Deployment Mode

A.1.2.1.5.2      Height Finder (Air Defense)

A.1.2.1.5.2.1      Side Net

- 1)    Weapon System
- 2)    Frequency Band
- 3)    Range (Km)
- 4)    Deployment Mode

A.1.2.1.5.2.2      Thin Skin

- 1)    Weapon System - SA-4
- 2)    Frequency Band
- 3)    Range (Km)
- 4)    Deployment Mode

A.1.2.1.5.3      Target Tracking/Fire Control (Air Defense)

A.1.2.1.5.3.1      Fire Can \*

- 1)    Weapon System - 57mm AAA
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Range (Km)
- 5)    Development Mode

A.1.2.1.5.3.2      Flap Wheel \*

- 1)    Weapon System - 57mm AAA
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Range (Km)
- 5)    Deployment Mode

A.1.2.1.5.3.3      Gun Dish

- 1)    Weapon System - ZSU-23-4
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Range (Km)
- 5)    Deployment Mode

\* Fire Control only. (May be obsolete.)

A.1.2.1.5.3.4      Land Roll

- 1)    Weapon System - SA-8
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Range (Km)
- 5)    Deployment Mode

A.1.2.1.5.3.5      Pat\_Hand

- 1)    Weapon System - SA-4
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Range (Km)
- 5)    Deployment Mode

A.1.2.1.5.3.6      Straight Flush

- 1)    Weapon System - SA-6
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Range (Km)
- 5)    Deployment Mode

A.1.2.1.5.4      Ground Surveillance

A.1.2.1.5.4.1      Pork Trough

- 1)    Weapon System - Artillery
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Deployment Mode

A.1.2.1.5.4.2      Small Yawn

- 1)    Weapon System - Artillery
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Deployment Mode

A.1.2.1.5.5      Meteorological

A.1.2.1.5.5.1      Bread Bin

- 1)    Weapon System
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Deployment Mode

A.1.2.1.5.5.2      End Tray

- 1)    Weapon System - Artillery
- 2)    Radar Type
- 3)    Frequency Band
- 4)    Deployment Mode

A.1.2.2      Friendly Forces

This section provides a description of the friendly forces, a typical U.S. Army Corps, to be considered for the development of an Automated CORDIVEM. The force is described in terms of its organic structure; force components in that organic structure; and the specific types of equipment, their numbers, and their characteristics. Specification of the force components and their characteristics will depend on the level of resolution and concepts for aggregation as determined by combining the command and control and combat interactions and effects with the user requirements for specific studies.

#### A.1.2.2.1

#### Operational Concepts

The Airland Battle 2000 is the umbrella concept describing the perceived battlefield. Corps operations to be represented in Automated CORDIVEM are derivations of that umbrella concept. Success on the modern battlefield will depend on the basic tenets of Airland Battle doctrine: initiative, depth, agility, and synchronization. In order to represent these concepts, it is essential to consider all those friendly forces concerned with the following:

- 1) Attacking deep in the enemy area.
- 2) Coordinating the deep attack with the close-in fighting.
- 3) Planning for the employment of nuclear-chemical-electronic means, either singularly or in combination with conventional means.
- 4) Organizing the corps and divisions to correspond in makeup and function to elements of the Airland Battlefield Team.

The following combat fundamentals shall be incorporated into Automated CORDIVEM:

An Army's doctrine is the way it fights its battles and campaigns, including the techniques, procedures, organizations, support, equipment, and training. An important function of doctrine is to establish common techniques of fighting. Standard practices will provide a common base. Army division and brigades shall execute the Airland Battle doctrine.

Commanders organize and assign intelligence priorities in order to look deep into the battlefield to determine the enemy's intentions and capabilities. Operations put the enemy in a disadvantaged position with a powerful initial blow from unexpected directions and then follow up rapidly to prevent recovery. The best results are obtained when initial blows are struck against critical units and areas whose loss will degrade the coherence of enemy operations, rather than merely against the enemy's leading formations. The U.S. Army's Airland Battle doctrine demands that initiative, depth, agility, and synchronization characterize all division operations.

Initiative implies an offensive spirit in the conduct of all operations. The underlying purpose of every encounter with the enemy is to seize or to retain independence of action. Division and brigade commanders issue mission orders with minimum coordinating restrictions and thus provide freedom to take advantage of fleeting battlefield opportunities. Subordinates deviate from the expected course of battle without hesitation after attempting to contact their commander when opportunities arise to expedite the overall mission of the higher force. The issuance of simple, flexible, and clear orders and plans to executing commanders facilitates initiative within the superior commander's intent.

Depth refers to time, distance, and resources. Divisions and brigades conduct operations in depth to achieve and maintain momentum in the attack and to ensure elasticity and security in the defense. Fighting a battle deep against appropriate enemy follow-on forces, deploying combat, combat support, and logistic elements in depth, and making arrangements to ensure availability of resources necessary for sustained operations are the essential ingredients for achieving depth. Effective reconnaissance, surveillance, and target acquisition provide timely warning. Knowing the time required to move forces, enemy and friendly, is essential to knowing how to employ fire and maneuver to destroy, to disrupt, or to delay the enemy. Conducting effective deep battle operations in support of the main effort,

identifying and concentrating support to the main effort, and maintaining an adequate reserve and efficient and timely logistic support enforce operations in depth.

Agility is a function of the responsiveness and flexibility of commanders, units, and staffs to respond to situations more rapidly than the enemy. It relies on efficient standardized procedures and command and control systems. Mission-oriented operations are simple and flexible. The basis of agility lies in well-trained units, simple plans and orders, rapid information synchronization systems (ingrained with common standing operating procedures), and commonly understood command and control measures. The one constant in battle is change, dealing with the unexpected. Division and brigade operations react and adjust to constantly changing circumstances. Three prerequisites for success in a dynamic battlefield environment are to see, to decide, to communicate, and thus act faster than the enemy.

Superior combat power is achieved when divisions and brigades synchronize all battlefield functions and capabilities to support an all-pervading unity of effort. The commander's concept of operation is executed by the synchronized use of cavalry, mechanized and tank battalions, artillery support, offensive air support, attack helicopters, engineers, military intelligence, air defense, and combat service support. A synchronized violent execution in support of a unified and well-understood battle plan is the essence of decisive combat. This principle applies as well to operations with other Services and allied forces.

Increased depth in distance and reduced time available characterize Airland Battle operations. The Airland Battle closely links real-time and future fighting. The real-time fighting is identified as the close-in and deep battles. Looking deep into areas of interest identifies future fighting planning requirements. Planning for real-time fighting assures that the deep battles provide time and space at the FLOT and creates opportunities for offensive action as the battle progresses. Planning also

assures that those necessary but scarce resources which produce the desired effects are diverted away from the close-in fighting for the deep battle. (See Figure A-19, Battle Responsibilities.)

Division and brigade commanders are concerned about an area of influence where they need to see and fight and an area of interest where they seek and receive information about the enemy. Determination of these two areas is based on the factors of mission, enemy, weather and terrain, troops and time available (METT-T). (See Figure A-20.)

The area of influence is the assigned area of operations. Within it, a commander acquires and fights close in and deep enemy units with assets that are organic to or in support of his command. The size of the geographical area of influence depends on the factors of METT-T. Higher headquarters assign it, designate its boundaries, and designate its forward terminating line.

The commander's area of interest is usually a portion of the area of influence of the higher headquarters and adjacent areas that contain enemy forces. These areas may have an impact on future operations and are therefore closely monitored. The higher headquarters usually provide information concerning the area of interest.

#### A.1.2.2.2      Force Organization

The division is the largest U.S. Army organization that trains and fights as a team. A division is organized with varying numbers and types of combat, combat support, and combat service support units. It usually fights as part of a larger force, most often a corps. Divisions, however, are the backbone of the Army and the land battle is won or lost by their battalions.

The following paragraphs will address the specific division types which will constitute the forces for the Automated CORDIVEM.

	<u>Close-In</u>	<u>Deep</u>	<u>Area of Interest</u>						
CORPS	<ul style="list-style-type: none"> <li>o Fights divisions against enemy first-echelon divisions.</li> </ul>	<ul style="list-style-type: none"> <li>o Attacks follow-on divisions.</li> <li>o Attacks first-echelon sustainers.</li> <li>o Provides divisions area of interest information.</li> </ul>	<ul style="list-style-type: none"> <li>o Receives information from higher echelon.</li> </ul>						
DIVISION	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th><u>Close-In</u></th> <th><u>Deep</u></th> <th><u>Area of Interest</u></th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>o Fights brigades against first-echelon regiments.</li> </ul> </td><td> <ul style="list-style-type: none"> <li>o Attacks follow-on regiments.</li> <li>o Attacks first-echelon sustainers.</li> <li>o Provides brigades area of interest information.</li> </ul> </td><td> <ul style="list-style-type: none"> <li>o Receives information from corps.</li> </ul> </td></tr> </tbody> </table>	<u>Close-In</u>	<u>Deep</u>	<u>Area of Interest</u>	<ul style="list-style-type: none"> <li>o Fights brigades against first-echelon regiments.</li> </ul>	<ul style="list-style-type: none"> <li>o Attacks follow-on regiments.</li> <li>o Attacks first-echelon sustainers.</li> <li>o Provides brigades area of interest information.</li> </ul>	<ul style="list-style-type: none"> <li>o Receives information from corps.</li> </ul>		
<u>Close-In</u>	<u>Deep</u>	<u>Area of Interest</u>							
<ul style="list-style-type: none"> <li>o Fights brigades against first-echelon regiments.</li> </ul>	<ul style="list-style-type: none"> <li>o Attacks follow-on regiments.</li> <li>o Attacks first-echelon sustainers.</li> <li>o Provides brigades area of interest information.</li> </ul>	<ul style="list-style-type: none"> <li>o Receives information from corps.</li> </ul>							
BRIGADE	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th><u>Close-In</u></th> <th><u>Deep</u></th> <th><u>Area of Interest</u></th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>o Fights battalions against first-echelon battalions.</li> </ul> </td><td> <ul style="list-style-type: none"> <li>o Attacks follow-on battalions.</li> <li>o Attacks first-echelon sustainers.</li> <li>o Provides battalions area of interest information.</li> </ul> </td><td> <ul style="list-style-type: none"> <li>o Receives information from division.</li> </ul> </td></tr> </tbody> </table>	<u>Close-In</u>	<u>Deep</u>	<u>Area of Interest</u>	<ul style="list-style-type: none"> <li>o Fights battalions against first-echelon battalions.</li> </ul>	<ul style="list-style-type: none"> <li>o Attacks follow-on battalions.</li> <li>o Attacks first-echelon sustainers.</li> <li>o Provides battalions area of interest information.</li> </ul>	<ul style="list-style-type: none"> <li>o Receives information from division.</li> </ul>		
<u>Close-In</u>	<u>Deep</u>	<u>Area of Interest</u>							
<ul style="list-style-type: none"> <li>o Fights battalions against first-echelon battalions.</li> </ul>	<ul style="list-style-type: none"> <li>o Attacks follow-on battalions.</li> <li>o Attacks first-echelon sustainers.</li> <li>o Provides battalions area of interest information.</li> </ul>	<ul style="list-style-type: none"> <li>o Receives information from division.</li> </ul>							

Figure A-19. Battle Responsibilities

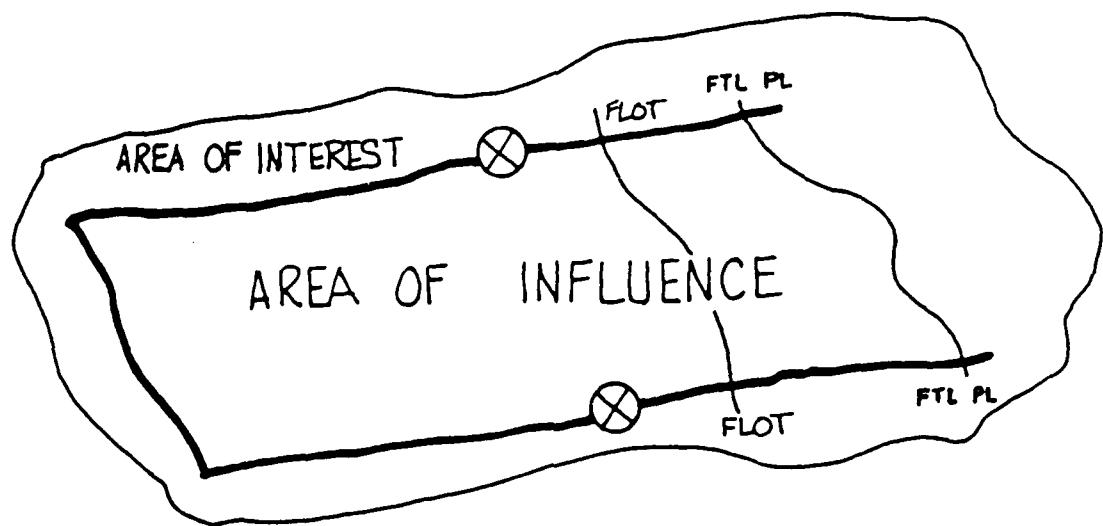


Figure A-20. Areas of Influence and Interest

#### A.1.2.2.2.1

#### Armored and Mechanized Divisions

The armored and mechanized infantry or heavy divisions are in transition during the 1980s. Organizational and technological changes in the Tables of Organization and Equipment (TOE) are occurring which improve the capability of the heavy division to accomplish its mission of destroying enemy armed forces and controlling the land area, its population, and its resources. The transition will convert H series organizations into J series organizations. Automated CORDIVEM will assist in the development of these changes.

The H series heavy division (see Figure A-21) is a standard combined arms grouping of division troops including a cavalry squadron, three brigades, a division artillery, a combat aviation battalion, and a division support command. Assigned tank and mechanized infantry battalions are provided to create either an armored division or a mechanized infantry division.

Significant changes to the J series (see Figure A-22) heavy division combined arms organizations include:

- Consolidation of all aviation assets and the cavalry squadron into the cavalry brigade, air attack.
- Four brigade headquarters (three conventional brigade headquarters and the cavalry brigade, air attack) for maneuver command and control.
- Different numbers of tank and mechanized battalions for armored and mechanized divisions (five and five for mechanized divisions and six and four for armored divisions).
- Restructured division cavalry squadron.

## H-SERIES DIVISION

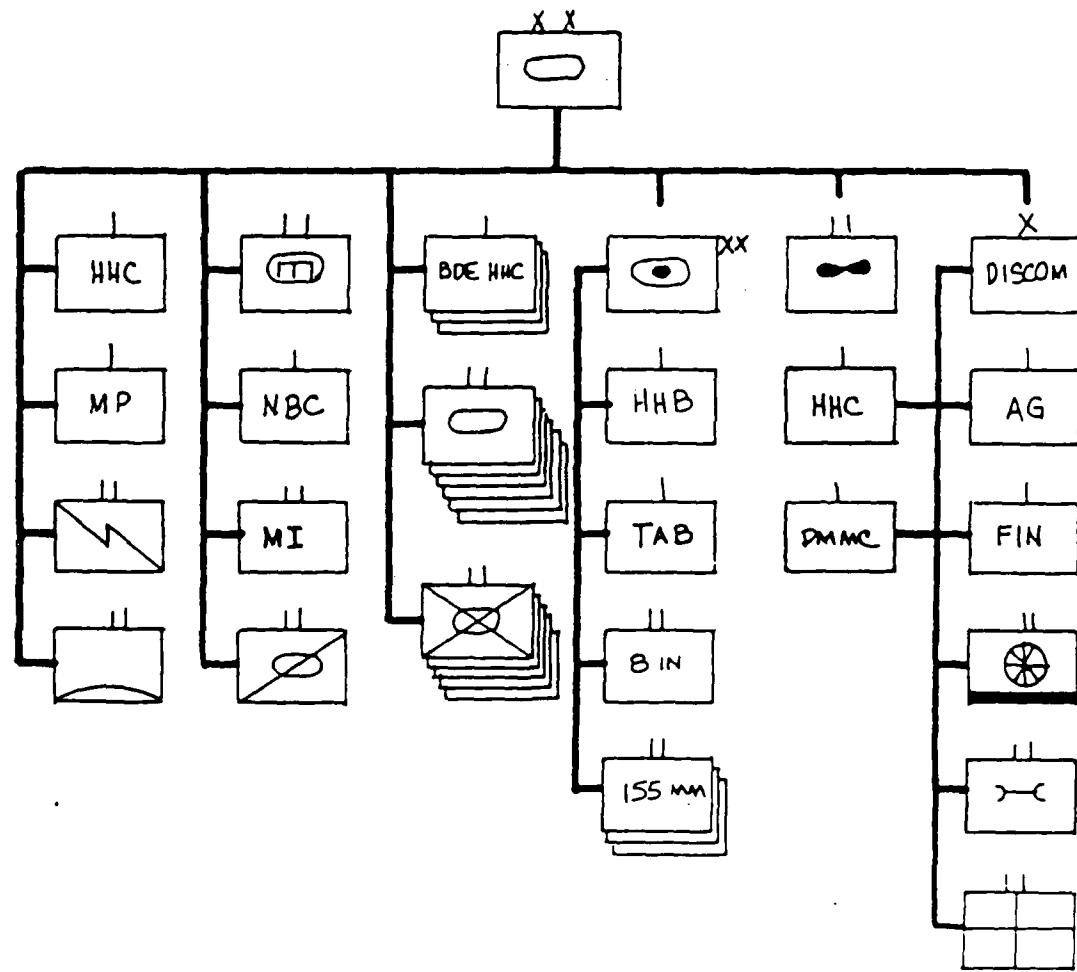


Figure A-21. Heavy Division, H Series

## J-SERIES DIVISION

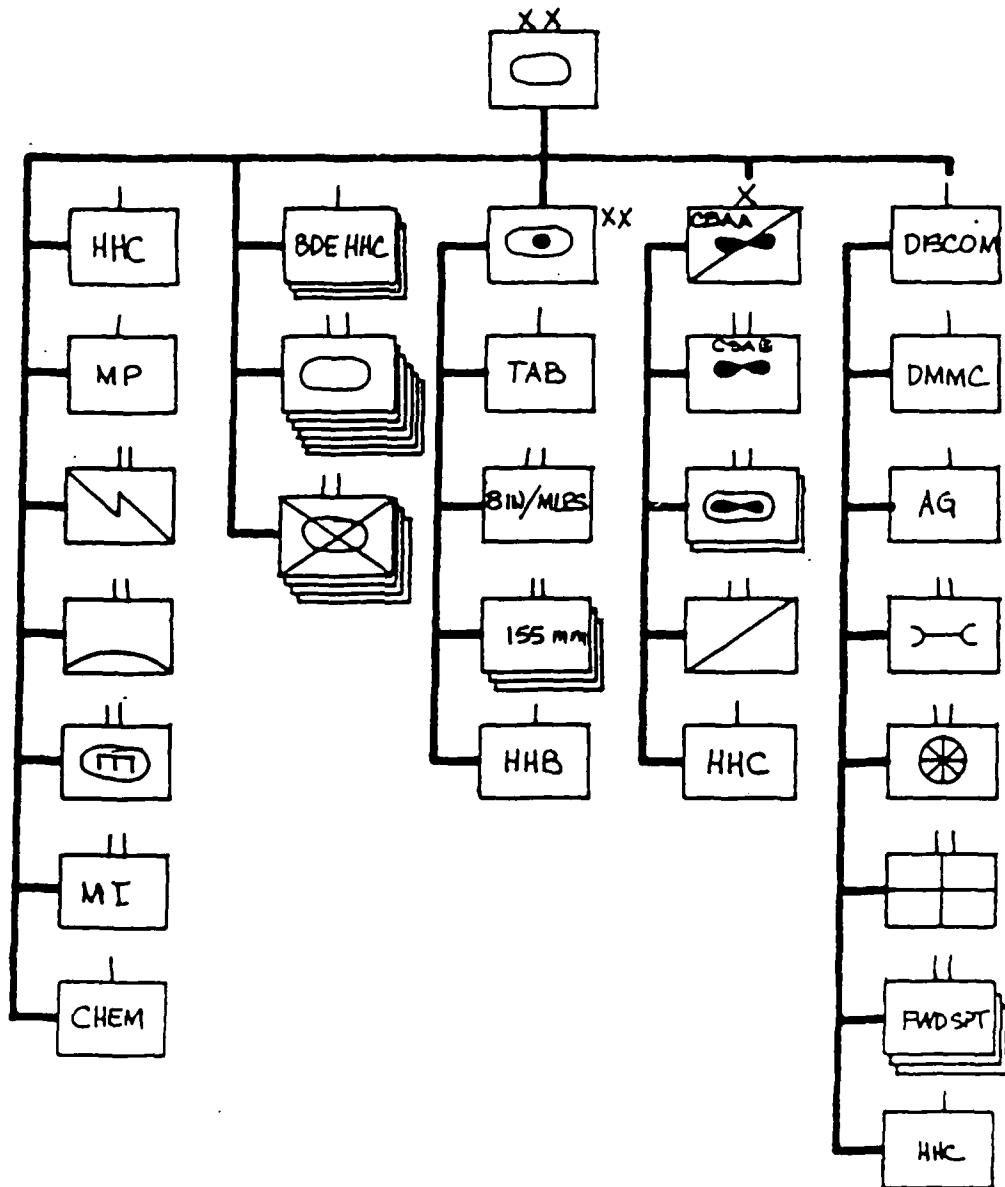


Figure A-22. Heavy Division, J Series

- o Significantly remodeled division support command.

H and J series divisions have the following types of organizations:

- o Command and Control
- o Maneuver
- o Cavalry
- o Field Artillery
- o Air Defense Artillery
- o Engineer
- o Signal
- o Military Intelligence and Electronic Warfare
- o Nuclear, Biological, and Chemical Defense
- o Military Police
- o Combat Aviation
- o Combat Service Support

One of the key elements in preparing for the battle is to thoroughly understand the troops available; their organization, capabilities, and limitations. In the process of transition, some organizations will change from their current H series Tables of Organization and Equipment (TOE) to an interim J series TOE using the current equipment on hand. For example, some tank and mechanized infantry battalions will organize into the J series TOE organization with M60 series tanks and M113s instead of M1 tanks and M2/3 vehicles. On the other hand, some organizations will convert directly from the H series TOE to the J series with new, high technology equipment. The timing of the conversion program will see active and reserve divisions under varying organizations. Commanders will use varying combinations of combined arms organizations to accomplish the Airland Battle mission.

Tables of Organization and Equipment (TOE) detail manpower and equipment authorizations for divisional units. Often, division units are organized under Modified Tables or Organization and Equipment (MTOE). To

determine manpower and equipment authorizations for a specific unit, it is necessary to refer to the authorization document (MTOE) for that unit. Appendix C of FM 71-100, Division Organizations, describes H and J series division organizations.

When divisions require additional forces or support, the higher headquarters commander provides combat, combat support, and combat service support to meet the needs of the mission and the operational area. FM 71-100, Section IV, chapter 4, describes the capabilities and limitations of additional maneuver units and Section XIII, Appendix C, describes other support commonly available.

#### A.1.2.2.2.2      Infantry Divisions

Infantry divisions are organized with varying numbers and types of maneuver battalions; however, the basic organizations are alike and each has:

- o A division headquarters and headquarters company and three brigade headquarters and headquarters companies which provide command control for units assigned or attached to the division. The division normally controls its three organic brigades; however, additional brigades (up to 5) may be assigned based on operational requirements.
- o Infantry, mechanized, and tank battalions to destroy the enemy and to seize and hold terrain.
- o An air cavalry squadron for reconnaissance, security, and economy of force operations.

- o A division artillery consisting of three light artillery battalions and a mixed medium/heavy artillery battalion to provide indirect fire support, a target-acquisition battery to assist in target acquisition, and a headquarters and headquarters battery for command control.
- o An air defense artillery battalion to help protect the division from air attack.
- o An engineer battalion for combat engineer support.
- o A signal battalion to provide communications between divisional command control installations such as division CPs (tactical, main, and rear), brigades, division artillery, and support command.
- o A combat electronic warfare intelligence battalion which collects, processes, and disseminates intelligence.
- o A nuclear, biological, and chemical defense company to provide for decontamination and to reconnoiter areas believed to be contaminated
- o A military police company to provide traffic control, security of enemy prisoners of war, and assistance in area security in the division rear.
- o A combat aviation battalion to provide command and control aircraft to the division, attack helicopter support, and air transport with a single lift capability of two rifle companies.

- o A division support command to provide combat service support to all assigned units of the division.

The number and types of maneuver battalions organic to infantry divisions vary. A typical division might be comprised of eight infantry battalions, one mechanized battalion, and one tank battalion.

To increase its combat power, field and air defense artillery, attack helicopter, and engineer units may be attached to or placed in support of the division.

#### A.1.2.2.2.3      Airborne Division

The airborne division is organized in much the same way as the infantry division. However, each of its units is organized with only that equipment needed to conduct parachute assaults or airland operations. If the airborne division is to conduct sustained combat operations, it normally must be reinforced with additional medium artillery, air defense protection, and transportation.

The airborne division is organized around nine airborne infantry battalions. It has a headquarters and headquarters company and three brigade headquarters to provide for command and control. As is true of the infantry division, the airborne division has:

- o An air cavalry squadron
- o An engineer battalion
- o A signal battalion
- o A combat electronic warfare intelligence battalion
- o A nuclear, biological, and chemical defense company
- o A military police company
- o A division support command

While the organization and equipment may vary somewhat between the two divisions, the airborne division units operate in essentially the same manner as an infantry division.

In addition to the units previously described, the airborne division has:

- o An armor battalion
- o Three antiarmor companies to provide long-range antitank guided missile fire.
- o A division artillery organized with three light field artillery battalions.
- o An air defense battalion organized with four gun batteries.
- o A combat aviation battalion organized with an attack helicopter company and two combat support aviation companies.

#### A.1.2.2.2.4      Air Assault Division

The air assault division is organized with:

- o Three infantry brigade headquarters.
- o Nine air assault infantry battalions.
- o A division artillery organized with three field artillery battalions and a target acquisition battery.

- o A division support command.
- o An air cavalry squadron.
- o An aviation group consisting of an assault support helicopter battalion, two assault helicopter battalions, and a general support aviation company.
- o An attack helicopter battalion (assigned to the aviation group for administration).
- o An engineer battalion.
- o A signal battalion.
- o An air defense artillery battalion.
- o A combat electronic warfare intelligence battalion.
- o A nuclear, biological, and chemical (NBC) defense company.
- o A military police company.

Air assault infantry division operations are conducted generally at a much higher tempo or over greater ranges than the infantry division.

A.1.2.2.3      Force Components

A.1.2.2.3.1      Armored Vehicles

A.1.2.2.3.1.1      Tank Characteristics

- 1) Main Armament
- 2) Track Life
- 3) Fuel Consumption
- 4) Range
- 5) Speed as Slope
- 6) Road Speed
- 7) Cross Country Speed
- 8) Targets

A.1.2.2.3.1.1.1      Examples

- 1) M1 Abrams Main Battle Tank
- 2) M60 Series Main Battle Tank

A.1.2.2.3.1.2      Armored Fighting Vehicle Characteristics

- 1) Armament
- 2) Elevation Angles of Main Gun
- 3) Road Speed
- 4) Fuel Capacity
- 5) Amphibious Characteristics
- 6) Target

A.1.2.2.3.1.2.1    Examples

- 1)   M551 Sheridan Armored Recon Vehicle
- 2)   Mobile Protected Gun
- 3)   Bradley Infantry Fighting Vehicle
- 4)   Light Armored Vehicle
- 5)   M901 Antitank Combat Vehicle
- 6)   M3 Bradley

A.1.2.2.3.1.3    Armored Personnel Carrier Characteristics

- 1)   Main Armament
- 2)   Passenger Capacity
- 3)   Crew
- 4)   Speed
- 5)   Load Capacity

A.1.2.2.3.1.3.1    Examples

- 1)   M113 Series Armored Personnel Carrier

A.1.2.2.3.2    Field Artillery Mortars and Infantry Support

A.1.2.2.3.2.1    Tube Artillery Characteristics

- 1)   Ammunition
- 2)   Basic Load
- 3)   Rate of Fire is Time
- 4)   Maximum Effective Range - Unassisted
- 5)   Maximum Effective Range - Rocket Assisted
- 6)   Mobility

A.1.2.2.3.2.1.1    Examples

- 1) M110A2 Self Propelled 8" Howitzer
- 2) M109 Series 155mm Self Propelled Howitzer
- 3) Division Support Weapon System
- 4) XM992 Field Artillery Support Vehicle
- 5) M198 155mm Towed Howitzer
- 6) M114A1 155mm Towed Howitzer
- 7) MY12 Copperhead 155mm Cannon Launcher Guided  
    Projectile
- 8) Advanced Indirect Fire System

A.1.2.2.3.2.2    Small Arms-Guns and Rifle Characteristics

- 1) Effective Range
- 2) Cycle of Fire
- 3) Round Capability
- 4) Penetration Capability
- 5) Ammunition
- 6) Targets

A.1.2.2.3.2.2.1    Examples

- 1) M1911A1 45 Caliber Pistol
- 2) M3A1 .45 Caliber Submachine Gun
- 3) M14 7.62mm Rifle
- 4) M21 7.62mm Sniper Rifle
- 5) M16A1 5.56mm Rifle
- 6) Close Assault Weapon System

1.2.2.3.2.3      Grenade Characteristics

- 1)    Effective Range
- 2)    Penetration Capability
- 3)    Target/Purpose
- 4)    Effects

A.1.2.2.3.2.3.1    Examples

- 1)    M26 Series Hand Grenade
- 2)    M33 Series Hand Grenade
- 3)    High Explosive Antiarmor Grenade
- 4)    AN/M-14 Incendiary Hand Grenade
- 5)    M18 Smoke Hand Grenade
- 6)    AN/M-8 Smoke Hand Grenade

A.1.2.2.3.2.4      Automatic Weapons Characteristics

- 1)    Effective Range
- 2)    Ammunition
- 3)    Cycle Rate

A.1.2.2.3.2.4.1    Examples

- 1)    M249 5.56mm Squad Automatic Weapon
- 2)    M60 7.62mm General Purpose Machine Gun
- 3)    M2HB 50 Caliber Heavy Machine Gun
- 4)    General Purpose Heavy Machine Gun

A.1.2.2.3.2.5      Mortar Characteristics

- 1)    Ammunition
- 2)    Basic Load
- 3)    Rate of Fire (Burst)
- 4)    Rate of Fire (Sustained)
- 5)    Minimum Range
- 6)    Maximum Range
- 7)    Mobility

A.1.2.2.3.2.5.1    Examples

- 1)    M224 60mm Lightweight Company Mortar
- 2)    M29A1 81mm Mortar
- 3)    XM252 81mm Mortar
- 4)    M30 4.2 Inch Heavy Mortar

A.1.2.2.3.2.6      Mine Scattering Systems Characteristics

- 1)    Types of Mine
- 2)    Capacity
- 3)    Saw Rate
- 4)    Mobility

A.1.2.2.3.2.6.1    Examples

- 1)    Ground Implaced Mine Scattering System
- 2)    Modular Pack Mine System
- 3)    M56 Heliborne Mine Dispensing System

A.1.2.2.3.2.7      Artillery Fire Control and Target Acquisition

- 1) Capacity
- 2) Weapons
- 3) Purpose
- 4) Mobility
- 5) Communications

A.1.2.2.3.2.7.1    Examples

- 1) TACFIRE Tactical Fire Detection
- 2) Field Artillery Tactical Data System
- 3) AN/USQ-70 Positioning and Azimuth Determining System
- 4) AN/TMQ-31 Meterological Data System
- 5) AN/TMQ-30 Automatic Meterological Station
- 6) Firefinder Artillery Locating System
- 7) Battlefield Development System
- 8) Remotely Monitored Battlefield Sensor Station
- 9) Remotely Piloted Vehicle
- 10) XM981 Fire Support Team Vehicle

A.1.2.2.3.3      Missile Artillery

A.1.2.2.3.3.1    Missile Characteristics

- 1) Payload
- 2) Range
- 3) Mobility
- 4) Speed

A.1.2.2.3.3.1.1 Examples

- 1) Pershing Ia Battlefield Support Missile
- 2) MCM52C Lance Battlefield Support Missile
- 3) Corps Support Weapon System
- 4) Multiple Launch Rocket System
- 5) Pershing II Battlefield Support Missile
- 6) Hellfire Helicopter Launched Antitank Missile

A.1.2.2.3.4 Antitank Weapons

A.1.2.2.3.4.1 Antitank Weapons Characteristics

- 1) Ammunition
- 2) Basic Load
- 3) Range
- 4) Velocity
- 5) Penetration
- 6) Special Mobility Characteristics

A.1.2.2.3.4.1.1 Examples

- 1) M79 40mm Grenade Launcher
- 2) Multi Shot Grenade Launcher
- 3) Riflemen's Assault Weapon
- 4) M202A1 66mm Incendiary Rocket Launcher
- 5) TOW Heavy Antitank Missile
- 6) TOW-2 Heavy Antitank Missile
- 7) IMAAWS (Infantry Man Portable Antiarmor Assault Weapon System)
- 8) M47 Dragon Medium Antitank Missile
- 9) Rattler Man Portable Antitank Weapon

- 10) Tank Breaker Antitank Missile
- 11) M7242 66mm Light Antitank Weapon
- 12) Viper Light Antitank Weapon
- 13) Special Hard Target Assault Weapon on LAW

A.1.2.2.3.5      Air Defense Weapons

A.1.2.2.3.5.1    AD Missile Characteristics

- 1) Guidance Type
- 2) Maximum Range
- 3) Maximum Altitude
- 4) Minimum Altitude
- 5) Capacity
- 6) Mobility
- 7) Special Characteristics

A.1.2.2.3.5.1.1    Examples

- 1) Patriot Tactical Air Defense System
- 2) MIM23B Improved Hawk Air Defense Missile
- 3) M48 Chaparral Forward Area Air Defense Missile System
- 4) U.S. Roland Forward Area Air Defense Missile
- 5) Antitactical Missile

A.1.2.2.3.5.2    Air Defense Gun Characteristics

- 1) Rates of Fire
- 2) Tracking Range
- 3) Slant Range
- 4) Horizontal Range

- 5) Mobility
- 6) Ammunition
- 7) Load Capacity
- 8) Special Characteristics

A.1.2.2.3.5.2.1 Examples

- 1) M163A1 20mm Vulcan Air Defense Gun
- 2) M988 Sargent York 40mm Division Air Defense Gun

A.1.2.2.3.6 Aircraft

A.1.2.2.3.6.1 Aircraft Characteristics

- 1) Type
- 2) Combat Radius
- 3) Speeds
- 4) Ceiling
- 5) Armament
- 6) Load Capacity
- 7) Special Characteristics

A.1.2.2.3.6.1.1 Examples

- 1) AH-64 Apache Advanced Attack Helicopter
- 2) AH-1 Cobra Series Attack Helicopter
- 3) UH-60H Blackhawk Transport Helicopter
- 4) UH-1H Heavy Utility Helicopter
- 5) CH-47D Chinook Medium Transport Helicopter
- 6) CH-54B Tarke Medium Light Helicopter
- 7) OH-58 Kiowa Light Observation Helicopter
- 8) OH-6A Cayuse Light Observation Helicopter

- 9) Army Helicopter Improvement Program
- 10) Light Helicopter Experimental
- 11) OV-1 Mohawk Reconnaissance/Surveillance

#### A.1.3           RED AND BLUE DATA BASE STRUCTURE

A key concern in organizing the Red and Blue force information is the necessity to provide a means for incorporating the information and data into an automated data base which can be used to facilitate development and application of the model. The following paragraphs define the essential elements to be included in the data bases and their relationships.

##### A.1.3.1       Force Description Criteria and Outline

The description of an echelon involves four important concepts: organizational hierarchy, internal description and assets, external interfaces, and force components. Figure A-23 represents a typical echelon and illustrates the four concepts which are described in succeeding paragraphs.

Each echelon (corps, division, brigade or battalion) is described according to the following outline:

- Echelon
  - Echelon Description
  - Echelon Manuever Assets
  - Echelon Combat Support Assets
  - Echelon Combat Service Support Assets

The echelon description and echelon assets are specified using the same outline based on Figure A-23. The outline appears below.

## TYPICAL ECHELON

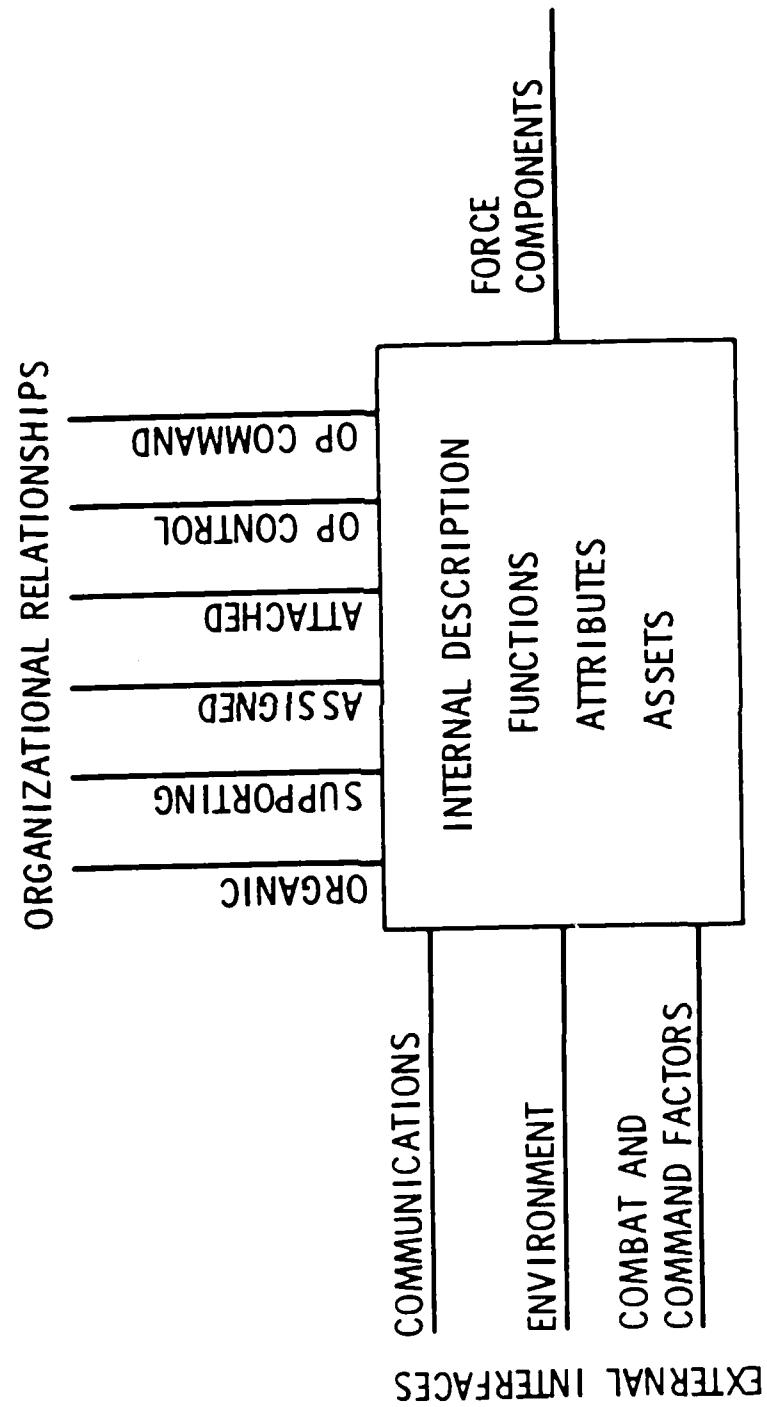


Figure A-23. Typical Echelon

X	Echelon (Or Echelon Asset) Description
X.1	Organizational Relationships
X.2	Internal Description
X.2.1	Functions
X.2.2	Attributes
X.2.3	Echelon Assets
X.3	External Interfaces
X.3.1	Communications
X.3.2	Environment
X.3.3	Combat and Command Control Factors
X.4	Force Components Used

The following paragraphs specify the content of the above outline in greater detail.

A.1.3.1.1      Organizational Relationships

Organizational hierarchy is described as an arrangement of subordinate/superior echelon relationships. In general, a hierarchy might be composed of three divisions for the single corps, three brigades for each division, and three battalions for each brigade. Using an expansion factor of three (as above) there would be one corps, three divisions, nine brigades and 27 battalions.

In addition to the organic relationship there are five other possible organizational relationships; including "organic" these relationships are:

- 1)      Organic
- 2)      Assigned
- 3)      Attached
- 4)      Supporting
- 5)      Operational control
- 6)      Operational command

The latter five relationships occur as a result of deployments in a particular scenario. The model must allow for these relationships to occur during a simulation; however only the organic relationship is required to describe the organization. For the above reasons the assigned, attached, supporting, operational control and operational command relationships are not covered in detail in this section.

A.1.3.1.2        Internal Description

The internal description of an echelon includes the assets, functions, attributes, combat and command and control factors of the echelon.

A.1.3.1.3        Functions

This portion of the data base details the functions of an organization. It specifies why a given unit is needed by its superior and what it does - but not how it does it.

A.1.3.1.4        Attributes

Attributes are data elements that further describe an organizational unit. Things such as capabilities, limitations, and method of employment are attributes. In addition, number, type, and function of command posts are also meaningful attributes for a unit.

A.1.3.1.5        Echelon Assets

In the description of an echelon, it is important to distinguish between ownership of assets belonging to subordinates and ownership of directly controlled assets. The directly controlled assets are termed "organic assets". An echelon may use these assets itself or assign (some of) them to a subordinate. For example, a brigade may have a medical battalion as an organic asset; it may assign companies of the medical

battalion to work with its subordinate battalions. In general the upper level echelons have maneuver, combat support and combat service support assets which they use or assign to subordinates. These assets are described separately from the echelon itself.

A.1.3.1.6        External Interfaces

The external interfaces of an echelon description specify the connection of the force components to other echelons and force components. These connections are associated with communications, combat, sensing, etc.

A.1.3.1.7        Communications

The communications interface specifies the type(s) of communication units and network(s) by which different friendly units communicate. The characteristics of the communication units are described under A1.2.2.3, Force Components.

A.1.3.1.8        Environment

Environment includes such things as type of terrain, roads and urbanization, weather, and certain combat effects such as smoke clouds and minefields. In general, the behavior of an echelon depends to some extent on the environment in which it exists. This section may indicate what aspects of the environment are important to a unit; the environment itself is described in detail elsewhere.

A.1.3.1.9        Combat, and Command and Control Factors

Combat, and command and control factors describe the representational data for the echelon assets and components. A summary of the factors is provided in the Battle Item Interaction and the Command and Control Item Interaction directories in Section 3.7 of the main report.

A.1.3.1.10

Force Components

Force components are a special case of external interface. Force components are things such as weapon systems, communications systems, etc.

A.1.4

COMBAT EFFECTS

A.1.4.1

Introduction

A.1.4.1.1

Purpose

This section describes the way in which the Red and Blue force structures, organizations, component elements, and functions combine on the battlefield. It provides the dynamics associated with the static descriptions provided in Sections A.1.1 and A.1.2. These dynamics are developed and described to a level of detail suitable for identifying the combat model functions described in Section 4 of the main report.

The following paragraphs address generic combat and C2 considerations and their importance on the battlefield. These discussions form the basis for describing the specific items and interactions provided in the tables and directories in Section 3 of the main report.

A.1.4.1.2

General Considerations

For virtually all applications of the Automated CORDIVEM, the fundamental problem is to accurately predict combat outcomes between opposing forces.

Facts bearing on the problem include:

- 1) The ability of a weapon system to affect a target is a function of the variables which comprise the target servicing time line which are (in turn):
  - a) Probability of detection (valid recognition of a potential, man-made, hostile target).
  - b) Probability of identification (valid determination that target is hostile).
  - c) Probability of acquiring (placing sights, cross-hairs, etc. on target and tracking).
  - d) Probability of engaging (firing first and subsequent rounds at target).
  - e) Probability of hitting (weapon strike on target).
  - f) Probability of affecting (target response to weapons strike or effect of weapon upon striking target).
- 2) The probability of detection is a function of the cues present in the battlefield. Cues are emissions or reflections, either direct or indirect which the sensor may identify as a hostile threat. Intervisibility, concealment, target activity, target profile, sensor capability and orientation (scanning area) all affect the ability to detect targets.

- 3) The probability of identification is a function of valid correlation of cues with target recognition criteria.
- 4) The probability of acquiring and engaging is a function of the acquisition characteristics of the weapon system, assigned sector of fires, range, weapon effectiveness, target activity, and fire control instructions.
- 5) The probability of hitting is a function of weapon effectiveness (rate of fire, accuracy, burst radius), range, target profile (sectional area of an exposure) and activity.
- 6) The probability of affecting (given a hit) is a function of the kinetic and/or chemical energy of the round, angle of incidence to the target surface, location of round strike, type and thickness of target armor at point of strike, and key target components in the path of the angle of refraction (given a penetration). Effects are normally grouped as:
  - a) Kills: destruction of key target components (personnel or equipment associated with the target) which prevent further effective hostile operations (catastrophic). Kills may be further subdivided into fire power or mobility.
  - b) Neutralization: semi-permanent (requires replacement or regrouping of crew or equipment) interruption of key operations necessary to continue effective operations.

c) Suppression: temporary interruption of key operations necessary to continue effective operations.

- 7) Individual weapons systems are normally grouped into small organizations (sections or platoons) for control of specific targets to be engaged or individual positions to be occupied. These small organizations are further grouped into larger companies or teams for control of target populations or sectors of terrain to be engaged and areas to be occupied. Companies or teams are also grouped into battalions or task forces which orchestrate the employment of both fire and maneuver toward a common goal or mission and integrate subordinate and supporting force operations. An adequate representation of the combat scoring process must address the synergistic as well as the limiting aspects of these groups of individual weapons.
- 8) Individual weapon systems, platoons, and companies are traditionally assigned preplanned employment (Figure A-24) positions. The following positions influence significantly the effective fire power of a given unit.

a) Primary position: optimum placement commensurate with terrain from which the system/organization can sense and fire within its assigned sector.

## UNIT POSITIONS

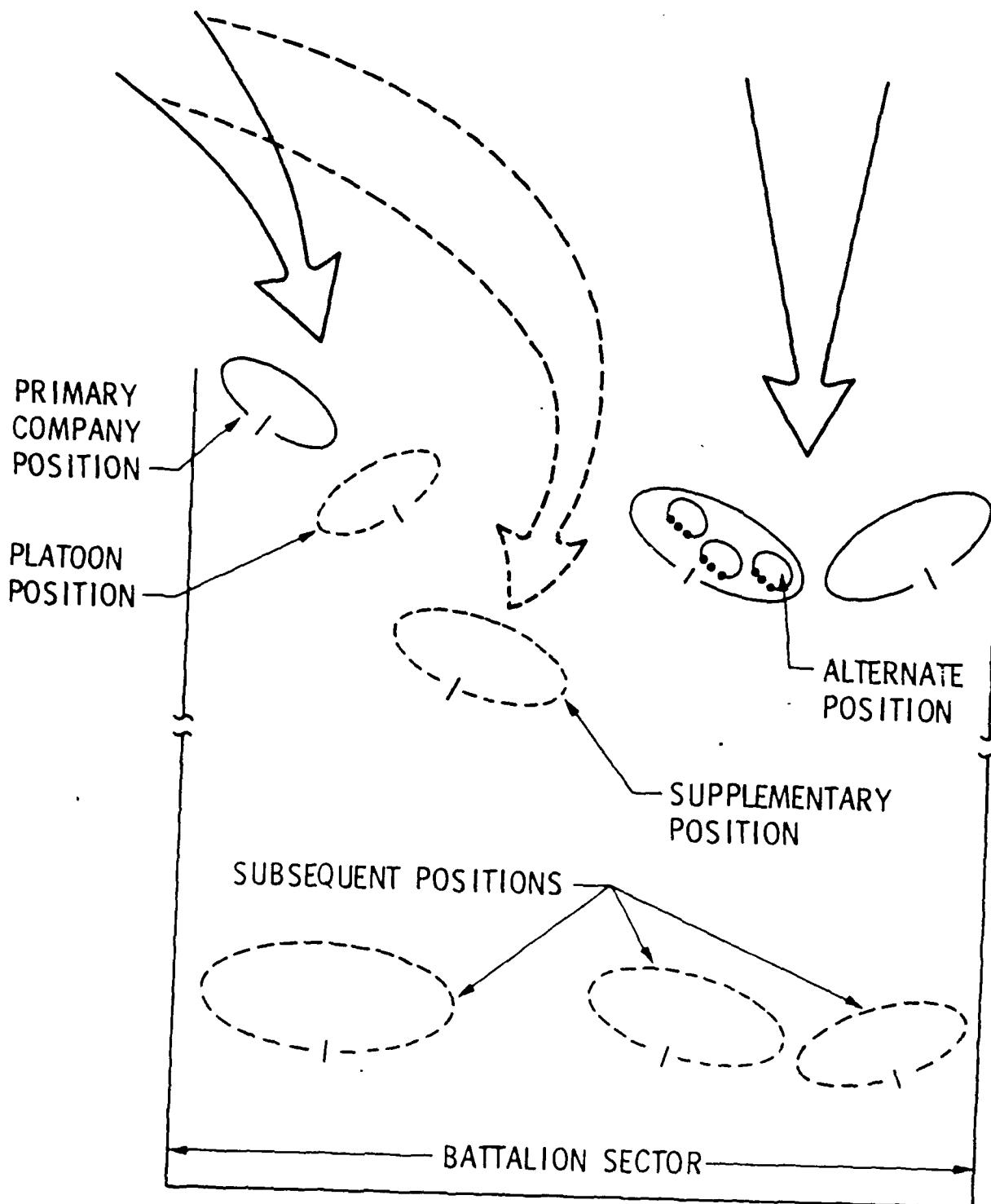


Figure A-24. Unit Positions

- b) Alternate position: other positions which may be used to sense and fire into its assigned sector.
  - c) Supplementary positions: those positions which the system/organization can move in order to sense and fire into a new sector.
  - d) Subsequent positions: positions selected in depth or to the flank, commensurate with terrain which require movement to occupy and reorient areas or sectors to sense and fire into.
  - e) Objectives: areas to be assaulted, occupied, and held until further orders.
- 9) Positions are organized for defense as a function of resources available (men, equipment, time, available terrain features, fields of fire) and anticipated time of occupancy. Based on resources expended and usable terrain features, positions are generally classified (from best to worse posture) as: fortified, improved, reconnoitered, or hasty. Although none of these "classifications" are considered discrete protective postures, fortifications usually are considered positions which have frontal, flank, and for certain systems, overhead cover and/or concealment where hasty positions are those chosen to utilize the cover and/or concealment of terrain features immediately available. The organization of a position can have an overriding influence on the available weapon systems and thus enhance or detract from the effective firepower of the unit.

- 10) Combat actions (both offensive and defensive) can also be classified as deliberate, hasty, or immediate depending on the amount of prior planning and coordination performed before commencement of the action. As a rule, deliberate actions are required when facing substantial opposition and entail detailed command and control procedures, total coordination of all systems (and many include rehearsals). Immediate actions are typified by issuing orders and coordinating activities as the action occurs.

A.1.4.1.3

General Discussion

Force-on-force confrontations can occur between moving or stationary forces at virtually any angle and at a wide range of postures between forces. How well a given force can cope with an opposing force is generally a function of the forces (anticipated direction of threat), disposition of weapons or groups of weapons, and the terrain occupied, all of which are interdependent. Both forces have an ability to influence the combat outcome through maneuver (moving groups of weapons to more advantageous firing or protective positions), fires (concentrating on most dangerous threat systems), or reinforcement (committing additional assets to the fight). As a rule, offensive operations are only conducted by a force when a significant numerical advantage exists over the opposing force. Here, the attacker attempts to mass an overwhelming force at optimum engagement range(s), preferably from a direction not anticipated by the defender. Attacks can be generally defined as (1) frontal, where the maneuvering force is advancing in the direction the defender has (probably) oriented the majority of his weapon systems; (2) flanking, where the maneuvering force is advancing against either side of the defensive position; (3) enveloping, when the force is attacking the "deep flank" or rear of the defended position; and (4) attack by fire, where weapon systems engage enemy positions by fire at optimum ranges but do

not advance against the defended position. More than one type of attack may be conducted in any given assault of a defended position. Meeting engagements may occur between two (or more) moving, opposing forces. Moving forces are oriented for immediate action in the direction of march and may (depending on their mission and formation) be capable of immediate action to either flank. Movement (both advancing and retrograde) is normally characterized by either: (1) bounding overwatch, where some organizations advance/withdraw while others overwatch/fire; or (2) traveling overwatch, where all systems move simultaneously.

Based on past conflicts and historical records, the Army has for some time predicted outcomes for force-on-force conflicts during field training in terms of "force multipliers". Force multipliers are used to increase the effectiveness of a given force based on its posture and/or actions during a conflict. Defending units were given a force multiplier (FM) of 2 to 5 depending on their utilization of terrain and protective posture. Today, the Army espouses that it can successfully defend outnumbered 3 to 1. Frontal assaulting units (Figure A-25) are given no FM but forces striking on an exposed flank (Figure A-26) or the rear of a defending force are usually given an FM of 3. Armored forces assaulting dismounted troops or "soft" targets are usually given an additional FM of 2 for "shock" effect. Forces conducting ambushes or surprise attacks against unprepared or unsuspecting forces are usually given an FM of 4. With the advent of more sophisticated ballistics testing and weapons effectiveness measurements came the capability to more accurately determine combat outcome measures of performance such as loss exchange ratios (ratio of enemy to friendly losses). These measurements can be made in the field using weapon engagement scoring systems (applying a normalized probability of kill given a laser pairing) or through computerized wargaming.

Today, all field devices, as well as computerized war games, incorporate some degree of averaging of combat effects which tends to cloud or proportionately reduce the credibility of the combat outcomes. The concern for the accuracy of data produced is justified due to the sensitivity of the

## FRONTAL ATTACK

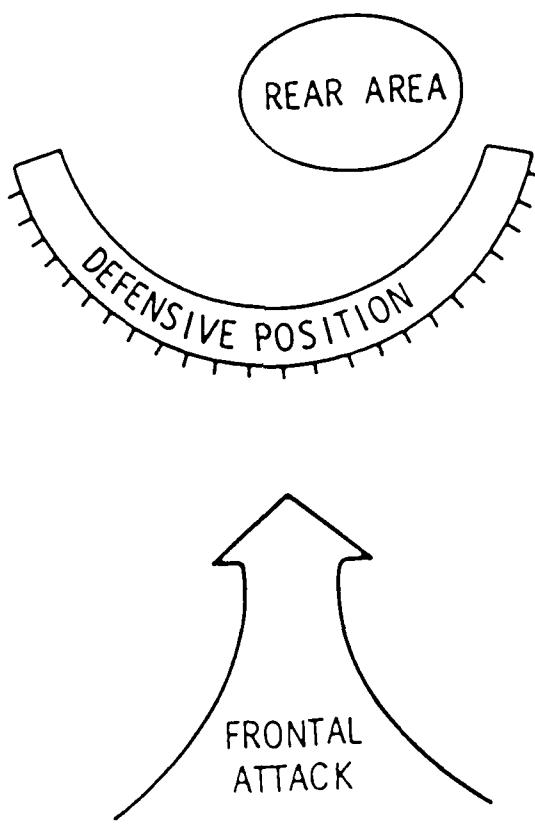


Figure A-25. Frontal Attack

## FLANK ATTACK

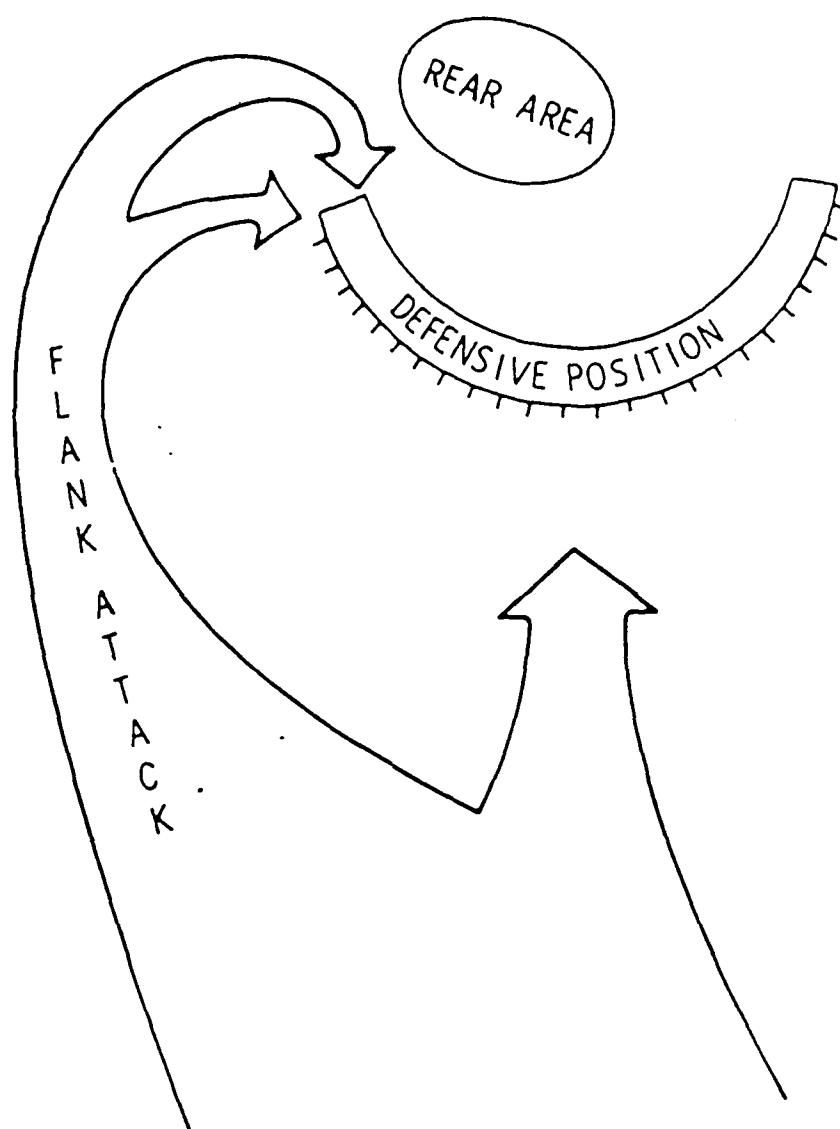


Figure A-26. Flank Attack

combat outcomes to the level of generalization. A clear need exists to develop engagement algorithm(s) which contain sufficient detail or demonstrated validity to account for all variables in the target servicing sequence. These algorithms should be capable of incorporating the effects of not only force sizes, types, orientation, terrain occupied, and intervisibility but also the effects of two or more forces attacking at any combination of directions (frontal, flank, rear) relative to the defender's orientation and allow the defender, relative to his planned defensive maneuvers, to adjust to these attacks.

The preceding discussion provides a general context for the development of a representation of combat. The discussion addressed combat interactions at a level of detail which will probably not be represented in the Automated CORDIVEM, however a discussion at this level does provide a basis for incorporating essential effects into the model. Section 3 of this document provides a description of the structure and process to be used for identifying and describing both command and control and battle effects.

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## GLOSSARY

AASLT	Air Assault
ABN	Airborne
ACAB	Air Cavalry Attack Brigade
ACC	Airspace Coordination Center
ACFT	Aircraft
ACR	Armored Cavalry Regiment
AD	Air Defense
ADA	Air Defense Artillery
ADM	Atomic Demolition Munitions
ADP	Automatic Data Processing
ADPC	Automatic Data Processing Center
AF	Air Force
AHB	Assault Helicopter Battalion
AI	Artificial Intelligence
AI	Area of Interest
AIM	Armored, Infantry, Mechanized Infantry
AMBL	Airmobile
AMIP	Army Model Improvement Program
AMMO	Army Model Improvement Program Management Office
ANSI	American National Standard Instruction
APC	Armored Personnel Carrier
ASHB	Assault Support Helicopter Battalion
ASL	Authorized Stockage List
ASOC	Air Space Operations Center
ASP	Ammunition Supply Point
ATGM	Anti-Tank Guided Munition
AVIM	Aviation Intermediate Maintenance
AVLB	Armored Vehicle Launched Bridge
AVN	Aviation

GLOSSARY (Continued)

BAI	Battlefield Air Interdiction
BDS	Battlefield Data System
BN	Battalion
BOC	Battalion Operations Center
BTRY	Battery
CAA	Concepts Analysis Agency
C&J CO	Collection and Jamming Company
C&J PLT	Collection and Jamming Platoon
CAS	Close Air Support
CASAA	Combined Arms Studies and Analysis Activity
CASTFOREM	Combined Arms and Support Task Force
C <sup>2</sup>	Command & Control
CEWIBN	Communications Electronic Warfare Intelligence Battalion
CEWIGP	Communications Electronic Warfare Intelligence Group
CMDS	Collection Management and Dissemination Section
COMINT	Communications Intelligence
COMMZ	Communication Zone
CONUS	Continental United States
CORDIVEM	Corps/Division Evaluation Model
COSCOM	Corps Support Command
CP	Command Post
CRC	Control and Reporting Center
CSA	Corps Storage Area
CSAC	Combat Support Aviation Company
CSR	Controlled Supply Rate
CSS	Combat Service Support
CSWS	Corps Support Weapon System
CDOC	Corps Tactical Operations Center (in the main command post)

GLOSSARY (Continued)

DDC	Division Data Center
DEFCON	Defense Readiness Condition
DF	Direction Finding
DISCOM	Division Support Command
DIVAD	Division Air Defense
DIVARTY	Division Artillery
DLOGS	Division Logistics System
DMMC	Division Materiel Management Center
DS	Direct Support
DSS	Direct Support System
DTOC	Division Tactical Operations Center
EAC	Echelons Above Corps
ECM	Electronic Counter Measures
EEI	Essential Elements of Information
ELINT	Electronic Intelligence
EMP	Electromagnetic Pulse
EW	Electronic Warfare
FA	Field Artillery
FAAR	Forward Area Alerting Radar
FAC	Forward Air Controller
FARO	Functional Area Requirements Objectives
FARP	Forward Arming and Refueling Point
FAS	Field Artillery Section (Corps)
FASCO	Forward Area Support Coordinating Officer
FDC	Fire Direction Center
FIST	Fire Support Team
FLOT	Forward Line of Own Troops
FORCEM	Force Evaluation Model
FRAGORD	Fragmentary Order

GLOSSARY (Continued)

FSE	Fire Support Element
FSL	Field Storage Location
G2	Intelligence Officer/Section
G2/S2	Intelligence Staff
G3	Operations Officer/Section
G3/S3	Operations Staff
GOC	Group Operations Center
GP	Group
GS	General Support
GS RADAR CO	Ground Surveillance Radar Company
GSR	General Support Reinforcing
GUARDRAIL	Airborne COMINT and DF system
HF	High Frequency
HIMAD	High to Medium Air Defense
HPI	High-Powered Illumination
ICC	Information Coordination Center
IOWAR	Improved Continuous Wave Acquisition Radar
I/EW	Intelligence/Electronic Warfare
IMINT	Imagery Intelligence
ISO	Interaction Standards Organization
MASH	Mobile Army Surgical Hospital
MCC	Movement Control Center
MLRS	Multiple Launcher Rocket System
MECH	Mechanized Infantry
MEDCOM	Medical Command
MMC	Materiel Management Center
MMDS	Mission Management and Dissemination Section

GLOSSARY (Continued)

MOC	Military Occupation Specialty
MOE	Measure of Effectiveness
MOHAWK	OV-10 fixed wing aircraft which carries SLAR, photo, imagery systems
MOP	Measure of Performance
MOPP	Mission Oriented Protective Posture
MP	Military Police
MRM	Maintenance Reporting and Management System
MSL	Missile
MTI	Moving Target Indicator
NBC	Nuclear, Biological and Chemical
NGF	Naval Gunfire
NGF TM	Naval Gunfire Team
NGFO	Naval Gunfire Officer
NICP	National Inventory Control Point
O/I	Operations and Intelligence Element
OIR	Other Intelligence Requirements
OPLAN	Operations Plan
OPORD	Operations Order
OPS	Operations
PAR	Pulse Acquisition Radar
PLL	Prescribed Load List
POL	Petroleum, Oil and Lubricants
PIL	Primary Target Lines

GLOSSARY (Continued)

QUICKFIX	Airborne Integrated SIGINT and Jamming System (helicopter)
QUICKLOOK	Airborne ELINT system (fixed wing)
R/S	Reconnaissance/Surveillance
RACO	Rear Area Combat Operations
RATT	Radio Teletype
RECCE	Reconnaissance
REMS	Remote Sensors
ROR	Range-Only Radar
S/F	Sound and Flash
S2	Intelligence Officer
SASP	Special Ammunition Supply Point
SELCOM	Select Committee
SHORAD	Short Range Air Defense
SIGGRAPH	Special Interest Group in Graphics
SIGINT	Enemy Signals Intelligence (including Communications Intelligence - COMINT, and Electronic Intelligence - ELINT)
SLAR	Side Looking Airborne Radar
SP	Self-propelled
STANAG	Standardization Agreement
TAB	Target Acquisition Battery
TAC CP	Tactical Command Post
TACFIRE	Tactical Fire Direction System
TACP	Tactical Air Control Party
TCAE	Technical Control Analysis Element
TOC	Tactical Operations Center
TOE	Table of Organization & Equipment

**GLOSSARY (Continued)**

TOA	TRADOC Operations Research Agency
TRADOC	Training and Doctrine Command
TRAILBLAZER	Ground Based COMINT and DF System
TRASANA	TRADOC Studies and Analysis Activity
TREE	Transient Radiation Effects on Electronics
TUOC	Tactical Unit Operations Center
XX	Symbol for Division
XXX	Symbol for Corps

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